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REPORT DCA-R-15

ARMY LIFE CYCLE COST MODEL

USER'S GUIDE, VOLUME I

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This document describes the Army Life Cycle Cost Model, a time sharing cost model which produces both static and time phased parametric cost estimates for major weapons systems. The output reports conform to the latest Research and Development, Investment, and Operating and Support pamphlets. The computer programs are avialable separately as Volume II.

FOREWORD

The Army Life Cycle Cost Model (ALLCM) documented in this User's Guide, is a time-sharing system which produces both static and time-phased parametric cost estimates for major Army weapons systems. The output reports conform to the latest Research and Development, Investment and Operating and Support pamphlets. Comments, questions or requests for programs should be directed to: DACA-CAS, Room 2B 679, the Pentagon, Washington, DC 20310, ATTN: Mr. Rich Brannon, AUTOVON 8-225-1118.

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CHAPTER 1

INTRODUCTION

1.1 Purpose. This guide records in one place the information the analyst needs to understand and operate the Army Life Cycle Cost Model.

1.2 Scope. Volume I (User's Guide) gives a general description of the model together with the specific details on how to run the model. Program listings and other technical information are in Volume II (Programmer's Guide).

1.3 Objectives. The first objective of this guide is to enable the analyst, assumed to be a non-programmer working alone, to operate the Army Life Cycle Cost Model. A second objective is to provide documentation which can serve as a starting point for developing future cost models.

1.4 How to Use This Guide. This guide can be used in three ways --

a. General Philosophy. To understand some of the philosophy of doing Independent Parametric Cost Estimates (IPCE) and how the Army Life Cycle Cost Model (ALCCM) helps in making these estimates, the analyst should read Chapters 1, 2 and 3. Some instructional material on composite indices, sensitivity analysis and uncertainty is at Appendices B and C.

b. Preparation of Inputs. To learn what specific data inputs are required and how they must be entered, the analyst should read Chapter 4, where illustrative samples of all types of data input files are provided. Sample output reports resulting from these input files are provided at Appendix A. The analyst can get a good understanding of how the data input files work by comparing the sample inputs to the sample output reports. Blank input forms for all file types are in Chapter 4.

c. Error Correction. To correct data input errors the computer program has discovered and reported, the analyst should first list the file containing the error. If the problem and its solution are not obvious, the analyst should turn to the explanation in Chapter 4.

CHAPTER 2

BACKGROUND

2.1 Cost Analysis in the Acquisition Process. Cost Analysis (See AR 11-18, "Army Programs, The Cost Analysis Program," October, 1975) assists the acquisition process in several ways --

a. Input to cost effectiveness studies. By estimating accurately the cost of several alternative weapons systems, cost analysis enables planners to make a realistic cost-effectiveness study.

b. Perspective. Cost analysis puts costs in proper perspective by comparing the new system to the various alternatives, including the "do nothing" alternative, which can also be very expensive.

c. Credibility. By the rigor and logic of its approach cost analysis can provide credibility to the cost estimate of a future system. When the Army asks OSD or the Congress for funding, the credibility of the cost estimate, or the lack of it, can be a determining factor. Documentation, described below, helps ensure credibility.

2.2 Independent Parametric Cost Estimates (IPCE's) in Cost Analysis. Each proposed weapon system has a sponsor, or proponent agency. This agency often has the best cost data base and the most knowledgeable staff in the world for that type of system, and the new system will be managed based on this agency's cost estimate. There are several reasons, however, why it is necessary to take a second look at the cost estimate.

a. Downward Bias of Proponent's Estimate. The proponent's cost estimates have often turned out to be lower than the actual cost, even after inflation has been taken into account (See "Should Cost/Will Cost/Must Cost," Wayne M. Allen, June 1972, (AD-758 820). One reason for a low cost estimate is the uncoupling of system requirements and their corresponding costs. A second reason is the practice of costing only the visible pieces (for example, the parts list and the manager's staff). Historically, most systems have experienced schedule slips, direction changes and other events which drive up the cost, even though they are not mentioned in the parts list. Other reasons for a low estimate are an overly optimistic attitude on the manager's staff and an organizational pressure to achieve a low cost. The process of taking a second look tends to couple the requirements and costs again, in both the proponent agency and the one doing the independent estimate. If the second estimate is statistical (or parametric) it links the requirements directly to the costs of historical systems. The resulting estimate automatically reflects the schedule slips and other events which have driven up the cost on historical systems. Finally, an independent agency can be more objective and free from organizational pressure than the sponsor.

b. Need for Completeness and Quality. A second look allows several questions to be answered. Is Operating and Support (O&S) cost addressed? Is the cost of Government-Furnished Equipment (GFE) included? Are all relevant costs included regardless of how they are funded? Are the numbers documented? It is important to have completeness and quality both in the proponent's estimate and the independent estimate (See "Standards for Presentation and Documentation of Life Cycle Cost Estimates for Army Weapon Systems," November 1975, Draft Pamphlet).

c. Identification of Areas of Uncertainty. A second estimate makes areas of uncertainty visible to management so that problems can be resolved or at least identified before making large funding commitments.

d. Increased Understanding. By making his own estimate the analyst develops a depth of understanding that is not obtainable in any other way. He can know and explain to management what is being given up (for example greater quantities, other mission equipment) for the new capabilities.

2.3 Tools Developed for IPCE's. This section gives a general description of some of the tools developed for making IPCE's. Some of the philosophy and objectives for the tools are also presented to make the tools more easily understood and to provide a starting point for future revisions of the tools.

2.3.1 Matrix. The most important tool is the Army Life Cycle Cost Matrix, shown at Figure 1. It is much more than an aid to communication,

THE ARMY LIFE CYCLE COST MATRIX

ROW	PRIME APPRO	DEFN REF	COST ELEMENT	(1) FRAME	(2) PROPULSION	(3) GUIDANCE CONTROL/ COMMUNICATIONS	(4) FIRE CONTROL	(5) ARMAMENT	(6) PAYLOAD/ AMMUNITION	(7) (TO BE SPECIFIED)	(8) PECULIAR SUPPORT EQUIPMENT	(9) COMMON SUPPORT EQUIPMENT	(10) OTHER	(11) TOTAL
1	----	1.0	RESEARCH AND DEVELOPMENT											
2	RDTE	1.01	DEVELOPMENT ENGINEERING											
3	RDTE	1.02	PRODUCIBILITY ENGINEERING AND PLANNING (PEP)											
4	RDTE	1.03	TOOLING	1)	2)									
5	RDTE	1.04	PROTOTYPE MANUFACTURING											
6	RDTE	1.05	DATA											
7	RDTE	1.06	SYSTEM TEST AND EVALUATION											
8	RD/OM	1.07	SYSTEM/PROJECT MANAGEMENT											
9	RD/OM	1.08	TRAINING											
10	RD/MC	1.09	FACILITIES											
11	RDTE	1.10	OTHER											
12	----	2.0	INVESTMENT											
13	PR/MC	2.01	NON-RECURRING INVESTMENT											
14	PROC	2.02	PRODUCTION											
15	PROC	2.03	ENGINEERING CHANGES											
16	PR/OM	2.04	SYSTEM TEST AND EVALUATION											
17	PR/OM	2.05	DATA											
18	PR/OM	2.06	SYSTEM/PROJECT MANAGEMENT											
19	PR/MC	2.07	OPERATIONAL/SITE ACTIVATION											
20	PR/OM	2.08	TRAINING											
21	PR/OM	2.09	INITIAL SPARES AND REPAIR PARTS											
22	PR/OM	2.10	TRANSPORTATION											
23	PR/OM	2.11	OTHER											
24	----	3.0	OPERATING AND SUPPORT COST											
25	----	3.01	MILITARY PERSONNEL											
26	MPA	3.011	CREW PAY AND ALLOWANCES											
27	MPA	3.012	MAINTENANCE PAY AND ALLOWANCES											
28	MPA	3.013	INDIRECT PAY AND ALLOWANCES											
29	MPA	3.014	PERMANENT CHANGE OF STATION											
30	----	3.02	CONSUMPTION											
31	PR/OM	3.021	REPLENISHMENT SPARES											
32	OMA	3.022	PETROLEUM, OIL AND LUBRICANTS											
33	PROC	3.023	UNIT TRAINING, AMMUNITION AND MISSILES											
34	----	3.03	DEPOT MAINTENANCE											
35	OMA	3.031	LABOR											
36	PR/OM	3.032	MATERIEL											
37	OMA	3.033	TRANSPORTATION											
38	PROC	3.04	MODIFICATIONS, MATERIEL											
39	----	3.05	OTHER DIRECT SUPPORT OPERATIONS											
40	OMA	3.051	MAINTENANCE, CIVILIAN LABOR											
41	OMA	3.052	OTHER DIRECT											
42	----	3.06	INDIRECT SUPPORT OPERATIONS											
43	MP/OM	3.061	PERSONNEL REPLACEMENT											
44	MPA	3.062	TRANSIENTS, PATIENTS AND PRISONERS											
45	OMA	3.063	QUARTERS, MAINTENANCE AND UTILITIES											
46	MP/OM	3.064	MEDICAL SUPPORT											
47	OMA	3.065	OTHER INDIRECT											
48	----	----	TOTAL SYSTEM COST (LESS ERDA)											
49	ERDA	4.0	ERDA COST											
50	----	----	TOTAL SYSTEM COST (WITH ERDA)											

(1) Primary cost cell (contains equation, must be documented).

(2) Secondary cost cell (contains total, subtotal, or percent, need not be documented).

FIGURE 1

because it determines the way the problem is conceptualized, both to the analyst and to management. A good framework has several characteristics. It is --

a. Complete. The matrix has to present 100% of the Life Cycle Cost Estimate without the need for footnotes explaining costs that do not fit into the structure. A complete structure also serves as a checklist to the analyst to ensure that nothing is overlooked, and communicates to the manager better than a lengthy narrative.

b. Parametric. The basic cost cells of the matrix (i.e. the intersections of rows with columns) should define things that can be estimated by a statistical relationship. This requirement leads to an emphasis on <u>what</u> is costed, and a corresponding deemphasis of other important, but not necessarily parametric considerations such as <u>how</u> costs are funded, whether the work is done by contract or in-house, how much has been spent so far, etc. Later, when it is necessary to address these issues, additional structures and formats are provided, but the primary matrix has not been compromised.

c. Manageable. The consideration of too much detail can preclude meaningful analysis and does not increase the quality of the estimate.

d. Compatible. It must recognize the reality of the existing data base on the one hand, and the needs of management on the other.

e. Comparable. It must be comparable to the different formats produced and required by different Army agencies, for example funding categories over time. Instead of compromising the main objectives by changing the matrix, however, additional structures are provided.

f. Flexible. It can be redefined, depending on need; has "other" rows and columns available for use as catch-alls; can still be used even in the event that some rows or columns do not apply (collapsable).

2.3.2 Cost Data Sheets. The rows and columns of the matrix intersect each other in cost cells. Some cells are used for totals and percents and are called "secondary cells". Other cells contain equations and are called "primary cells". Each primary cost cell contains an equation with requirements factors expressing "how many" and "what" is costed in that cell, together with cost factors expressing the corresponding cost. In order to record how an estimate was made, a Cost Data Sheet is used. It shows the equation used, and defines each of the variables in the equation. When all the Cost Data Sheets are complete, there can be no question about the clerical part of how an estimate was calculated, and the discussion can proceed to more important matters, such as why certain first unit costs and slopes were used, or why so many operating personnel were charged to the system. These "why" questions are answered separately on the Variable Explanation Sheets described next. A sample Cost Data Sheet is at Figure 2.

CELL NO: A (2 ,1)
DATE: 1 JAN 76

COST DATA SHEET

ITEM: Development Engineering, Frame

COST DATA EXPRESSION:

Cost = (Number of Man-Years) X (Cost per Man-Year)

INCLUDES:

Development engineering, frame and integration.

EXCLUDES:

Mission equipment package.

FINAL COST MODEL EXPRESSION:

A(2,1) = XN(1)*AC(1)*SF(1)

VARIABLES ARE:

XN(1) = Number of Engineering Man-Years = 100.0

AC(1) = Cost per Engineering Man-Year = .05(M $ 72)

SF(1) = Constant Dollar Shift Factor, RDT&E = 1.1

FIGURE 2

2.3.3 Variable Explanation Sheets. After recording on the Cost Data Sheet how the factors are to be defined and multiplied together, the analyst must record why he uses the value chosen. This is done using Variable Explanation Sheets. Each variable used has one or more sheets explaining how the variable was defined for the system being costed, the value (or values) finally selected, and all the documentation supporting this choice, including the data base for the Cost Estimating Relationship (CER), the statistics for the CER and other pertinent information. A sample Variable Explanation Sheet is at Figure 3.

2.3.4 Computerized Model. The Army Life Cycle Cost Model, described more fully in Chapter 3, brings together the results of the statistical analysis (documented on the Variable Explanation Sheets), the equations in the cost cells (documented on the Cost Data Sheets) and generates the reports. While some models combine statistics, report generating and documentation in one computer program, this model uses a modular system in which the separate functions are coordinated with each other but are handled separately. Thus the statistics are done using a commercial statistical package designed to be flexible and convenient. The Army Life Cycle Cost Model takes the results of the statistical analysis (for example, first unit costs) calculates the total cost, and generates the reports. Documentation of each Cost Estimating Relationship (CER) is so unique that the Variable

CELL NO: A (2 , 1)
DATE: 1 JAN 76

VARIABLE
EXPLANATION SHEET

ITEM: XN(1), Number of MY, Engineering Development

SYSTEM	AMPR WT	NUMBER MY
1	X	Y
2	X	Y
3	X	Y
4	X	Y
5	X	Y

CER: MY = 10.5 + 39(WT)

Statistics: $R^2 = .99$

-

-

-

etc

DATA SOURCE: Jane's All the Worlds Aircraft, 1974, pp 99-125

FIGURE 3

Explanation Sheets are done individually. The data input files which drive the program provide documentation of each cost estimate. Figure 4 shows the relationship between the tools available.

DOCUMENTATION PHILOSOPHY

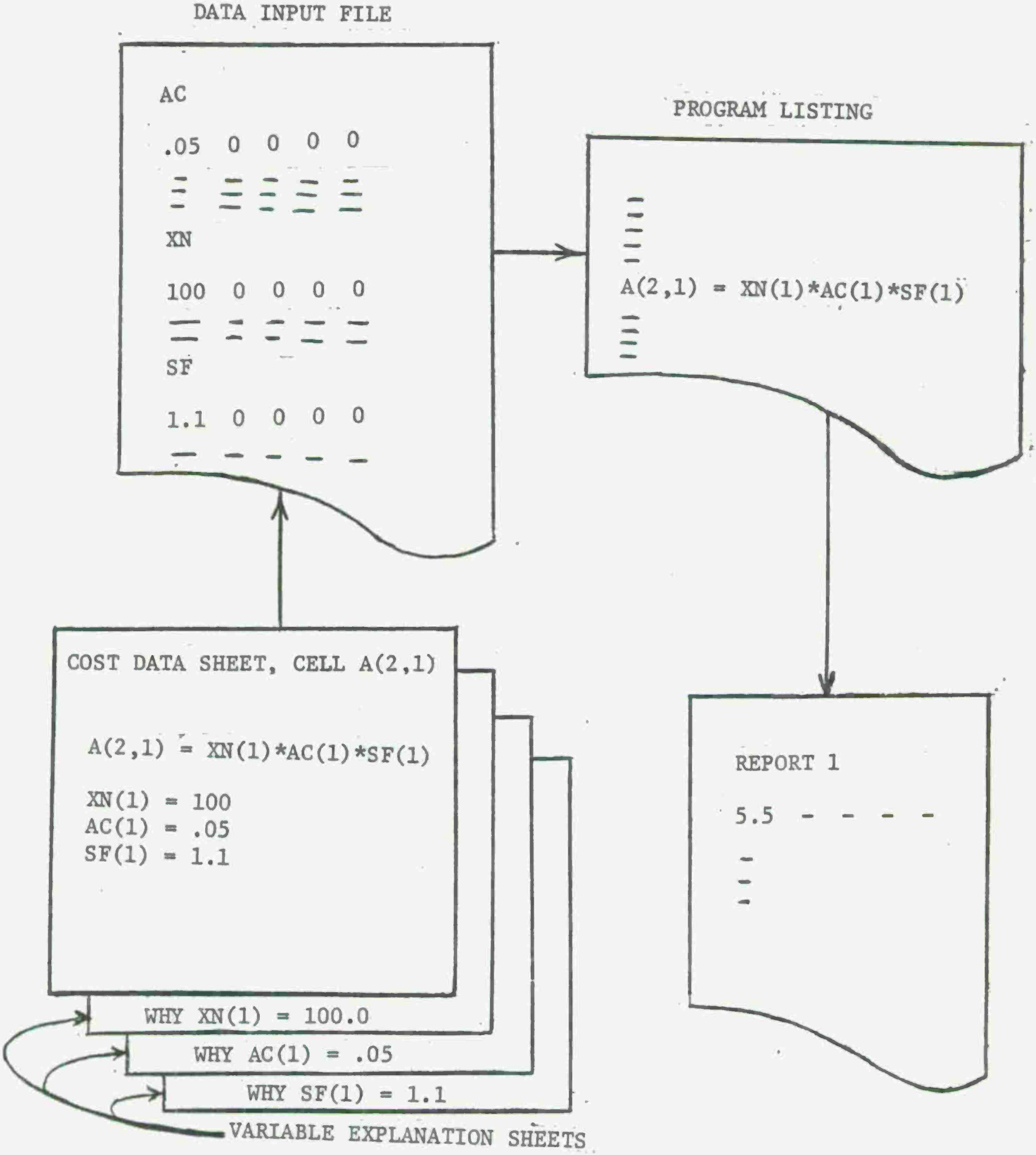


FIGURE 4

CHAPTER 3

THE ARMY LIFE CYCLE COST MODEL

3.1 Objectives of Model. Some of the objectives designed into the model are --

a. Convenience. The model is designed for the analyst's use, not for programming efficiency. Any tradeoff here is made in favor of the analyst.

b. Manageability. The model uses only the minimum number of inputs. The use of too much detail can interfere with meaningful analysis and does not improve the quality.

c. Responsiveness. The model uses a time sharing computer for fast response. Programming changes are handled within the office, as needed. There is no dependence on outside agencies for programming support.

d. Standard Language. The model is programmed in Fortran IV. Statements and subroutines are limited to those which are widely available among commercial vendors.

e. Error Checks. The model checks the analyst's input files for errors. If an error is detected, the program prints the name of the file containing the error and the number of the last line correctly read. Also, when the analyst uses percentages, the program checks to see that the percentages add to 100%.

f. Flexibility. The model can be redefined by the analyst. He can redefine and relabel the rows and columns, and he can change the standard equations in the model.

3.2 Capabilities of Model. The Army Life Cycle Cost Model produces static and time-phased reports as listed in Table 1 and shown in Appendix A. Each report is calculated based on information the analyst provides in an input file. The program asks only for those files actually required, depending on what reports the analyst requests. The rest of this section discusses specific capabilities and how to use them.

a. Change of Base Year. It is easy to change the base year in which costs are expressed. Each primary cost cell is provided with a factor (called a "shift factor" and abbreviated SF) which can be set to 1.00 for no change, or to some other appropriate price index for expressing costs in dollars of another base year. Different shift factors are used for different cells, depending on the most likely appropriation for that cell. To use this feature the analyst first chooses an input base year. For example, if his statistical data base is in Fiscal Year (FY) 72 dollars, a convenient input base year would be FY 72. Having chosen an input base year, the analyst must enter all average costs, first unit costs and thru-puts in millions of dollars of that base year. The inflation of the out-year costs will be discussed later, but it is emphasized that all average costs, first unit costs and thru-puts must be entered in millions of dollars of the selected input base year. Next, the analyst selects an output base year. For example, during FY 76 management would be interested in FY 77 dollars. The

ARMY LIFE CYCLE COST MODEL REPORTS

REPORT	REPORT NAME	TYPE $	Data Input File	Definition File	Appropriations File	Time Phasing File	Composite Index File	Header File
1	Cost Element by System Structure	Constant	X					X
2	Key Cost Definitions	Constant	X	X				X
3	Appropriations by Life Cycle Phase	Constant	X		X			X
4	Appropriations by Year (RD, Inv, O&S)	Constant	X		X	X	X	X
5	Appropriations by Year (Total)	Constant	X		X	X	X	X
6	Appropriations by Year (RD, Inv, O&S)	Current	X		X	X	X	X
7	Appropriations by Year (Total)	Current	X		X	X	X	X
8	Appropriations by Life Cycle Phase	Current	X		X	X	X	X

TABLE 1

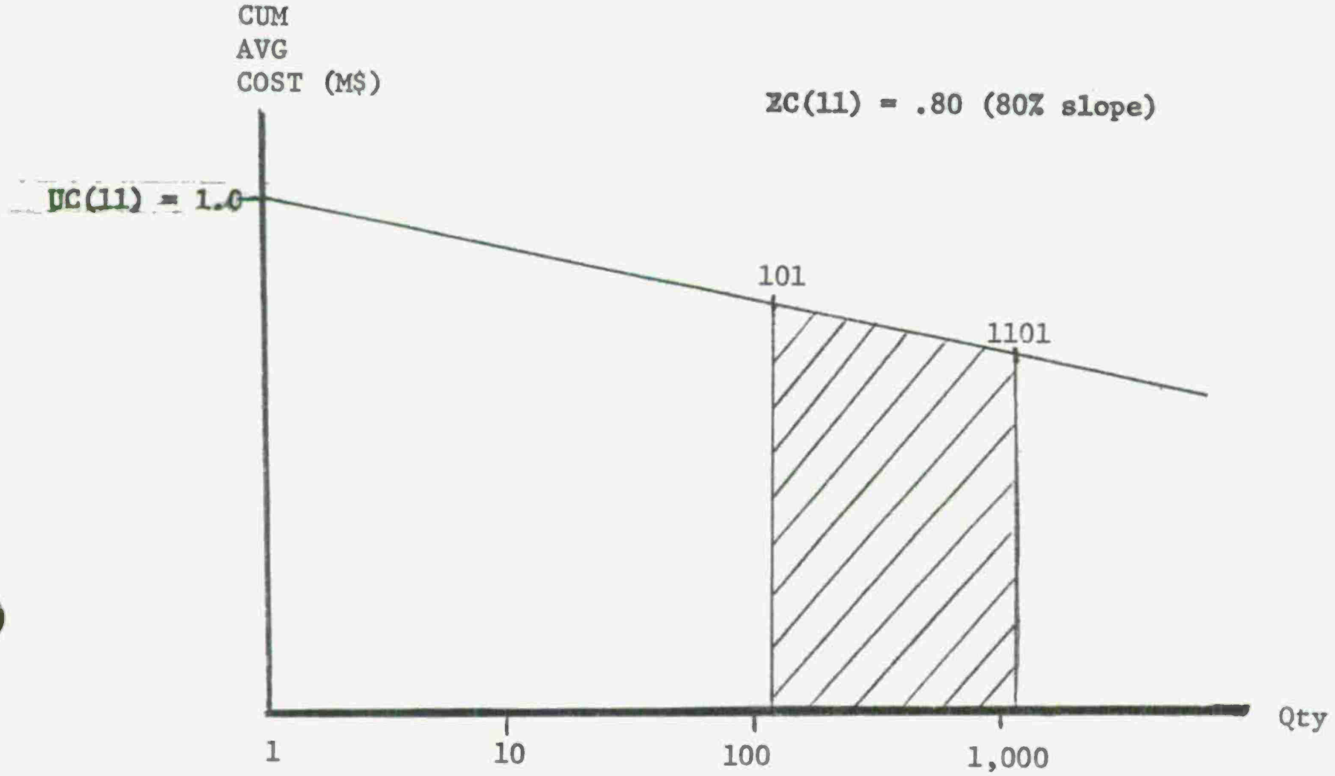
analyst then enters the shift factors which will convert the costs from FY 72 dollars to FY 77 dollars. The program multiplies the FY 72 dollar amounts by the correct shift factor and the result is an amount in FY 77 dollars.

b. Thru-puts. The analyst can add an amount to the results of any primary cost cell. He can use this capability in place of the existing equation (by setting one of the variables in the equation to zero), or he can use the capability in addition to the existing equation (by using both the equation and the thru-put). Thru-puts must be entered in millions of dollars of the <u>input</u> base year, since they will be multiplied by the correct shift factor. One common use of thru-puts is when the result is known, for example if the R&D phase is complete and the final cost is available.

c. Learning Curves and Previous Buys. The Army Life Cycle Cost Model uses the cumulative average learning curve theory (as opposed to the unit curve theory). This theory is often expressed using the formula $Y = aX^b$, where Y is the cumulative average cost over a quantity of X units, a is the theoretical first unit cost, X is the quantity, and b is the logarithm of the experience curve slope divided by the logarithm of 2. In the model the notation becomes UC for theoretical first unit costs, XN for quantities, B for log (slope)/log (2), and EC for the experience curve slopes. The variable B is calculated by the program, so the analyst only has to enter the variables UC, XN and EC. When using learning curve theory, it is sometimes necessary to consider the existence of a previous buy. This occurs, for example, when another service has already purchased some production lots. To begin counting from some unit other than unit one, simply set the correct PB variable to the number of units to be skipped. Figure 5 shows an example where the Army will buy 1,000 airframes, after another service has already bought 100 airframes. Thus, the Army buys airframes numbered 101 through 1101. To develop the correct cost, the analyst sets the PB variable to 100, then enters the UC, XN and EC as he would normally (i.e., as if there was no previous buy). The program does all the required calculations.

d. Time-Phasing. The model produces time-phased reports both in constant and in current dollars. In order to use this capability the analyst must understand how the program calculates the reports based on the time-phased data inputs. For each type of appropriation (RDT&E, MCA, OMA, etc) and for each life cycle phase (R&D, INV, O&S) which he wants to use, the analyst must specify the time-phased flow of funds. He does this by giving ten years of current dollar amounts and up to 28 constant dollar percentages. The program was designed to accept current dollar amounts because the analyst usually has available the actual dollar amounts for this year and for several previous years. The analyst inputs what he has, and the computer calculates constant or current dollars, as needed. In order to

USE OF PB VARIABLE



Input:

XN(101) = 1000
PB(11) = 100
UC(11) = 1.0
EC(11) = .80

Result:
Model calculates total cost of 1,000 units, starting at unit 101.

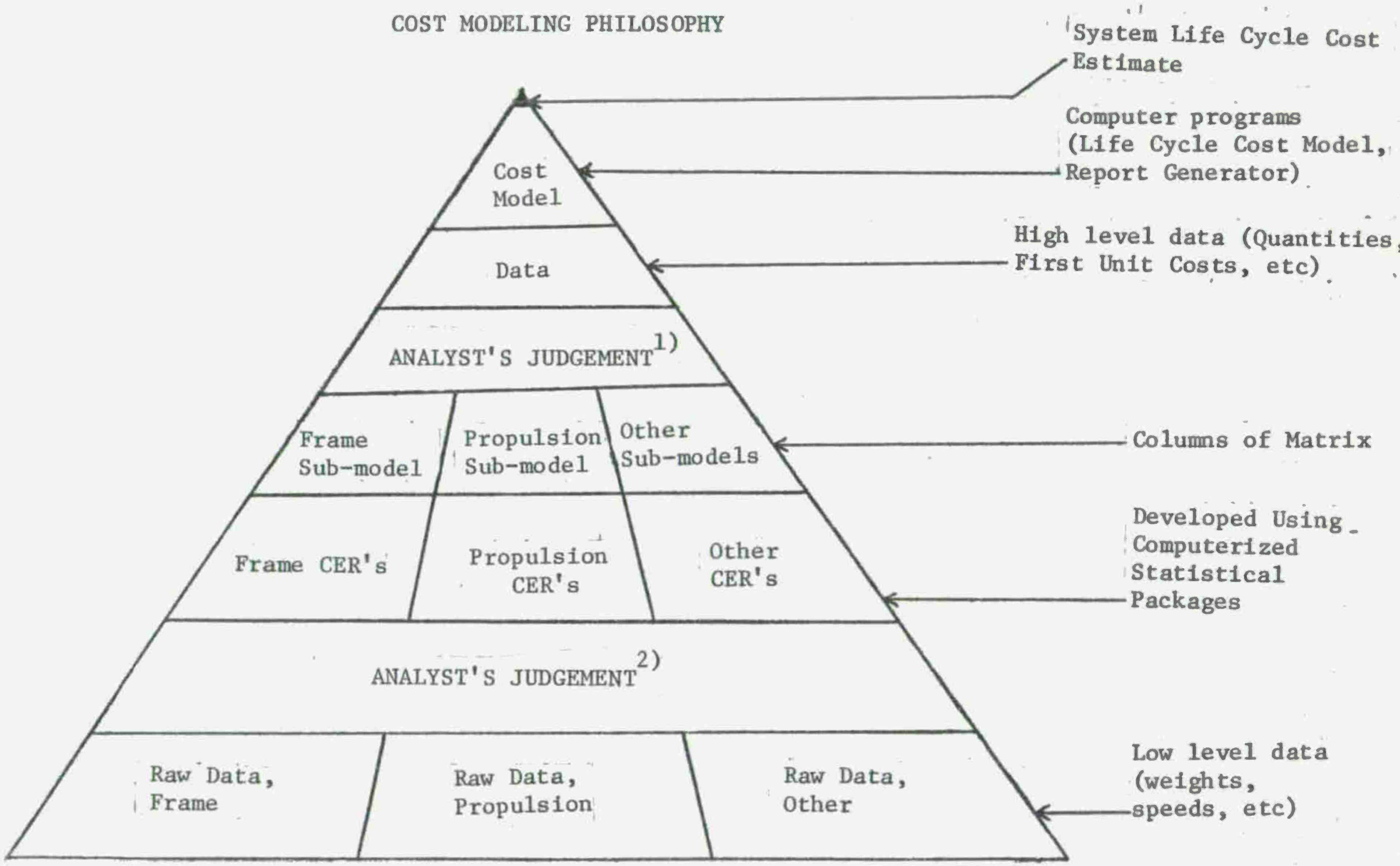
FIGURE 5

compute the cost streams the model first changes all the current dollar amounts entered by the analyst to constant dollar amounts using the composite inflation indices discussed in Appendix B. These ten amounts are then subtracted from the total constant dollar amount for that appropriation and phase (taken from Report 3) to give a residue. This residue is distributed over the future years, based on the percentage distribution which the analyst specifies. The results to this point are constant dollar cost streams (Reports 4 and 5). The program calculates the current dollar cost streams from the constant dollar cost streams by applying the composite inflation indices discussed in Appendix B. The results are Reports 6 and 7.

3.3 System Description of Model. This section first discusses the cost modeling philosophy and then describes the model as a set of computer programs.

a. Cost Modeling Philosophy. Figure 6 shows the computer model as the last part of a total system that transforms raw data on historical systems into a life cycle cost estimate of a future system. An important part of the cost modeling philosophy is to insert the analyst at the two critical places where judgement is required. Judgement is required first to select appropriate historical systems for the data base, and further judgement is required to create parametric CER's from this data base. Later, judgement and a knowledge of the proposed weapon system is required to make the system fit into

COST MODELING PHILOSOPHY



1) Analyst makes judgements, records decisions on Cost Data Sheets and Variable Explanation Sheets.

2) Analyst selects appropriate historical systems for data base, gathers and normalizes data.

FIGURE 6

the cost matrix and to evaluate and choose among the various CER's developed. The Army Life Cycle Cost Model, pictured at the top of Figure 6, is a set of computer programs that take high level data such as quantities, first unit costs, etc, and calculate and print the various life cycle cost reports. The same set of programs are applicable to all Army weapons systems including aircraft systems, missile systems, track and wheeled vehicle systems.

b. Computerized System. Figure 7 is a diagram of the Army Life Cycle Cost Model as a set of computer programs. The first program contains all the equations on the cost data sheets. The program reads a data input file, previously typed in by the analyst, then calculates the life cycle cost for the weapon system. Finally, this program writes the cost results to an output file whose name is supplied by the analyst at run time. If this output file were listed, it would look much like Report 1, but without row labels or column headings. When preparing the data input file, the analyst should refer to Chapter 4.2. The second program reads the output file created by the first program and prints the final reports. A series of interactive questions guides the user through the program. It always asks which reports are required, and the name of the output file created by the first program. Depending on which reports are requested, it then asks for the name of the other required input files, which must have been previously typed in. For each file type required (see Table 1), the user should turn to the appropriate section of Chapter 4 for instructions on how to prepare that file.

THE ARMY LIFE CYCLE COST MODEL AND REPORT GENERATOR

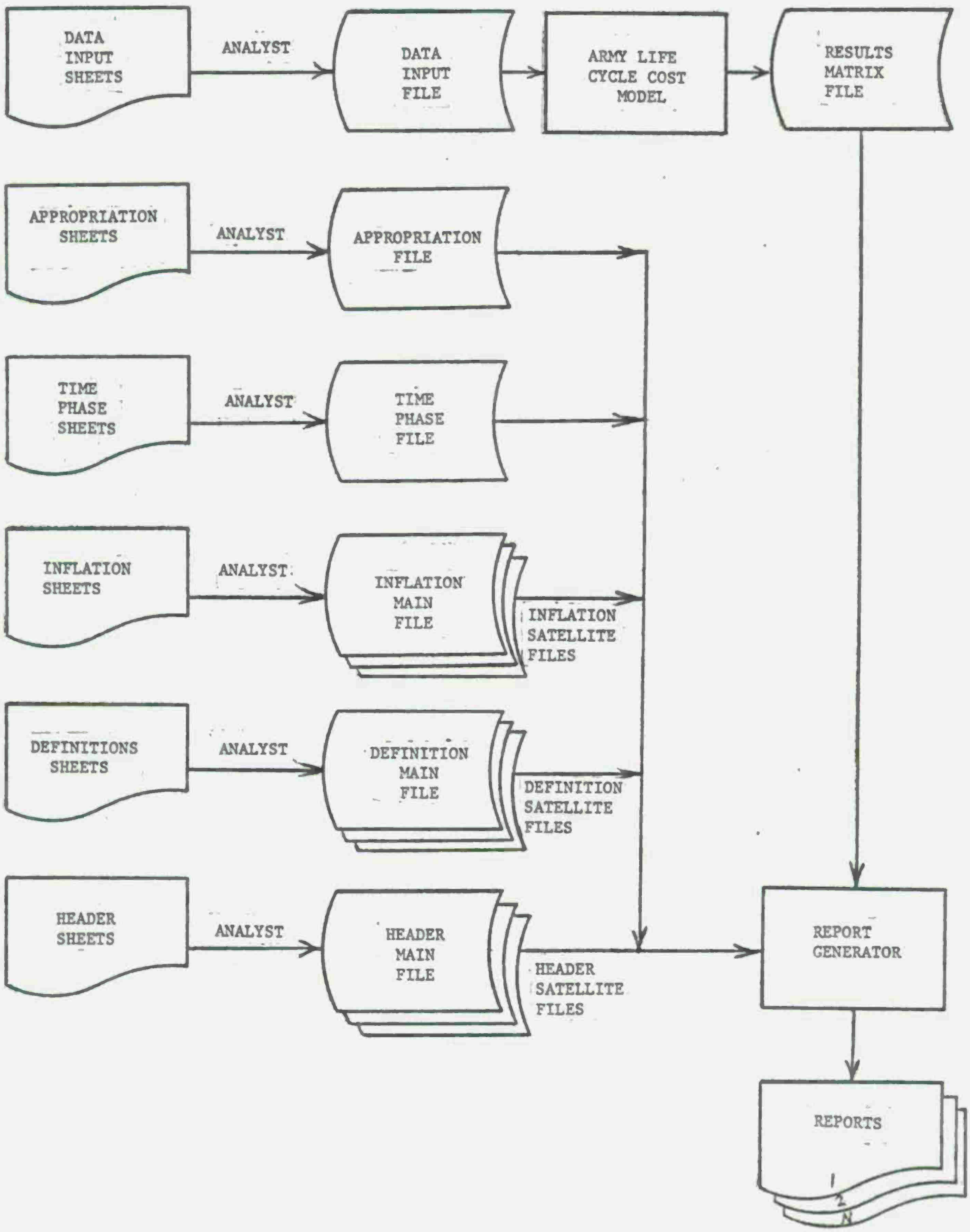


FIGURE 7

CHAPTER 4

HOW TO USE THE MODEL

4.1 General. This chapter explains how to create the required input files, how to enter the present time-sharing system, how to run the model and report generator, and how to use some of the time-sharing commands on the present system. Before reading this chapter the analyst should read Chapter 3 to get a general overview of the model. The line numbers used in all examples are for reference only, and the analyst may choose any line numbers he wishes.

4.2 Requirements Data and Cost Data Input. There are nine types of input variables, as listed in Table 2. The values for these variables are entered on the blank data input sheets and then typed into an on line file using the format of Figure 8. After the input variables are entered, the analyst may choose to add an amount (called a thruput) to the results of any primary cost cell. He can use this capability <u>in place of</u> the existing equation (by setting one of the equation's variables to zero), or he can use the capability <u>in addition to</u> the existing equation (by adding the thruput to the results calculated by the equation). When entering thruputs the analyst must enter the amount in millions of dollars of the input base year, because these amounts will be multiplied by the correct shift factor. Each of the nine types of variables and the thruputs

INPUT VARIABLES

Variable	Description
SF --	Shift Factors (change the base year of the constant dollar life cycle cost estimate from the input base year to the output base year. Inflation of cost streams is handled separately).
XN --	Quantities (numbers of equipment, number of engineering manyears required, etc).
YN --	Numbers of years (operating life, etc).
AC --	Average Costs (average cost per manyear, etc).
CF --	Cost Factors (one element is calculated as a percent of another element).
UC --	Theoretical First Unit Cost (the model uses the cumulative average learning curve theory).
EC --	Experience Curve Slope (expressed as a decimal; e.g., 95% learning is entered as .95).
PB --	Previous Buys (used when the first unit to the Army is not the first unit to the manufacturer, for example, the case of an airframe previously brought by the Navy).
PC --	Physical or Performance Characteristic (Number of miles between overhauls, etc).

TABLE 2

are entered in a variable block consisting of a top line (containing a line number and the variable type identifier) and several data lines (containing a line number and five data values). The program reads the data values line by line, so that the first data line in each block is interpreted as data values one through five, the second line as data values six through ten, etc. It is important to have the correct number of lines for each data block used. There must be exactly five data values on each data line. The data blocks may be entered in any order, since the top line identifies the type. Any data block may be deleted, in which case all the values for that type are set to zero. If the shift factors are deleted, for example, the whole matrix would be zero. A sample Data Input File and preprinted forms follow.

SAMPLE DATA INPUT FILE

INPUTS

```
100  BASE   YEAR   77
110  MODEL   MICO
120  SF
130  1.1  1.1  1.1  1.1  1.1
140  1.1  1.1  1.1  1.1  1.1
150  1.1  1.1  1.1  1.1  1.1
160  THRUPUTS
170  ROW  COL  AMT
180  2  1  1000.0
190  2  1  200
200  2  2  300
210  3  1  400
220  3  2  500
```

Notes:

1. Line 100. Must be entered as shown, except that in place of 77 enter the selected output base year (the year describing the costs after applying shift factors).

2. Line 110. Must be entered as shown, except that in place of MICO enter AIRCO, MICO or TRACO to designate the aircraft, missile or track model.

3. Lines 120-150. This is a sample variable block. Even variables not used must be entered (as zero).

4. Lines 160-170. The thruputs block, if used, must be last. The first two lines of the thruput block must be exactly like lines 160 and 170.

5. Line 180. The first and second pieces of data designate the row and column to receive the thruput. The last entry is the amount (in millions of dollars of the input base year). The amount will be multiplied by the correct shift factor.

6. Line 190. Notice that more than one thruput may be added to the same cell, in this case cell A(2,1).

7. Line 220. Any number of thruputs may be used.

FIGURE 8

DATA INPUT SHEETS

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
100	AC			
105		1	2,1	Devel Engr, Frame, M$/MY
		2	2,2	" Propulsion, M$/MY
		3	2,3	" Guid/Control "
		4	2,4	" Fire Control "
		5	2,5	" Armament "
110		6	2,6	" Payload/Ammo "
		7	2,7	" TBS "
		8	2,8	" Pec Spt "
		9	2,9	" Com Spt "
		10	2,10	" Other "
115		11	7,1	Syst Test/Eval, Frame, M$/Period
		12	7,2	" Propulsion "
		13	7,3	" Guid/Control "
		14	7,4	" Fire Control "
		15	7,5	" Armament "
120		16	7,6	" Payload/Ammo "
		17	7,7	" TBS "
		18	7,8	" Pec Spt "
		19	7,9	" Com Spt "
		20	7,10	" Other "

FIGURE 9

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
125	________	21	8,1	Syst/Proj Mgt, Frame, M$/MY, gov't
	________	22	8,1	" Frame " contr
	________	23	8,2	" Propulsion, M$/MY, gov't
	________	24	8,2	" Propulsion " contr
	________	25	8,3	" Guid/Control " gov't
130	________	26	8,3	" Guid/Control " contr
	________	27	8,4	" Fire Control " gov't
	________	28	8,4	" Fire Control " contr
	________	29	8,5	" Armament " gov't
	________	30	8,5	" Armament " contr
135	________	31	8,6	" Payload/Ammo " gov't
	________	32	8,6	" " " contr
	________	33	8,7	" TBS " gov't
	________	34	8,7	" " " contr
	________	35	8,8	" Pec Spt " gov't
140	________	36	8,8	" Pec Spt " contr
	________	37	8,9	" Com Spt " gov't
	________	38	8,9	" Com Spt " contr
	________	39	8,10	" Other " gov't
	________	40	8,10	" Other " contr

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
145	________	41	9,1	Training, Frame, M$/MY
	________	42	9,1	" " M$/SET
	________	43	9,2	" Propulsion, M$/MY
	________	44	9,2	" " M$/SET
	________	45	9,3	" Guid/Control, M$/MY
150	________	46	9,3	" " M$/SET
	________	47	9,4	" Fire Control, M$/MY
	________	48	9,4	" " M$/SET
	________	49	9,5	" Armament, M$/MY
	________	50	9,5	" " M$/SET
155	________	51	9,6	" Payload/Ammo, M$/MY
	________	52	9,6	" " M$/SET
	________	53	9,7	" TBS, M$/MY
	________	54	9,7	" " M$/SET
	________	55	9,8	" Pec Spt, M$/MY
160	________	56	9,8	" " M$/SET
	________	57	9,9	" Com Spt, M$/MY
	________	58	9,9	" " M$/SET
	________	59	9,10	" Other, M$/MY
	________	60	9,10	" " M$/SET

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
165	________	61		Reserved (R)
	________	62		R
	________	63		R
	________	64		R
	________	65		R
170	________	66		R
	________	67		R
	________	68		R
	________	69		R
	________	70		R
175	________	71	14,1	Production, Rec Engr, Frame, M$/MY
	________	72	14,2	" " Propulsion, M$/MY
	________	73	14,3	" " Guid/Control "
	________	74	14,4	" " Fire Control "
	________	75	14,5	" " Armament "
180	________	76	14,6	" " Payload/Ammo "
	________	77	14,7	" " TBS "
	________	78	14,8	" " Pec Spt "
	________	79	14,9	" " Com Spt "
	________	80	14,10	" " Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
185	______	81	14,1	Production, QC, Frame, M$/MY
	______	82	14,2	" Propulsion, M$/MY
	______	83	14,3	" Guid/Control "
	______	84	14,4	" Fire Control "
	______	85	14,5	" Armament "
190	______	86	14,6	" Payload/Ammo "
	______	87	14,7	" TBS "
	______	88	14,8	" Pec Spt "
	______	89	14,9	" Com Spt "
	______	90	14,10	" Other "
195	______	91	16,1	Syst Test/Eval, Frame, M$/Period
	______	92	16,2	" Propulsion "
	______	93	16,3	" Guid/Control "
	______	94	16,4	" Fire Control "
	______	95	16,5	" Armament "
200	______	96	16,6	" Payload/Ammo "
	______	97	16,7	" TBS "
	______	98	16,8	" Pec Spt "
	______	99	16,9	" Com Spt "
	______	100	16,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION			
205	______	101	18,1	Syst/Proj Mgt,	Frame,	M$/MY,	Gov't
	______	102	18,1	"	Frame		Contr
	______	103	18,2	"	Propulsion		Gov't
	______	104	18,2	"	Propulsion		Contr
	______	105	18,3	"	Guid/Control		Gov't
210	______	106	18,3	"	"	"	Contr
	______	107	18,4	"	Fire Control	"	Gov't
	______	108	18,4	"	"	"	Contr
	______	109	18,5	"	Armament	"	Gov't
	______	110	18,5	"	"	"	Contr
215	______	111	18,6	"	Payload/Ammo	"	Gov't
	______	112	18,6	"	"	"	Contr
	______	113	18,7	"	TBS	"	Gov't
	______	114	18,7	"	"	"	Contr
	______	115	18,8	"	Pec Spt	"	Gov't
220	______	116	18,8	"	"	"	Contr
	______	117	18,9	"	Com Spt	"	Gov't
	______	118	18,9	"	"	"	Contr
	______	119	18,10	"	Other	"	Gov't
	______	120	18,10	"	"	"	Contr

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
225	________	121	20,1	Training Services, Frame, M$/MY
	________	122	20,2	" " Propulsion, M$/MY
	________	123	20,3	" " Guid/Control "
	________	124	20,4	" " Fire Control "
	________	125	20,5	" " Armament "
230	________	126	20,6	Payload/Ammo, "
	________	127	20,7	TBS "
	________	128	20,8	Pec Spt "
	________	129	20,9	Com Spt "
	________	130	20,10	Other "
235	________	131	20,1	Training Sets, Frame, M$/Tng Set
	________	132	20,2	" Propulsion "
	________	133	20,3	" Guid/Control "
	________	134	20,4	" Fire Control "
	________	135	20,5	" Armament "
240	________	136	20,6	" Payload/Ammo "
	________	137	20,7	" TBS "
	________	138	20,8	" Pec Spt "
	________	139	20,9	" Com Spt "
	________	140	20,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
245	______	141	22,1	Transportation (1st & 2nd dest), Frame, M$/Unit
	______	142	22,2	" Propulsion "
	______	143	22,3	" Guid/Contr "
	______	144	22,4	" Fire Contr "
	______	145	22,5	" Armament "
250	______	146	22,6	" Payload/Ammo "
	______	147	22,7	" TBS "
	______	148	22,8	" Pec Spt "
	______	149	22,9	" Com Spt "
	______	150	22,10	" Other "
255	______	151	31,1	Replenishment Spares, Frame, $/unit of activity
	______	152	31,2	" Propulsion "
	______	153	31,3	" Guid/Contr "
	______	154	31,4	" Fire Contr "
	______	155	31,5	" Armament "
260	______	156	31,6	" Payload/Ammo "
	______	157	31,7	" TBS "
	______	158	31,8	" Pec Spt "
	______	159	31,9	" Com Spt "
	______	160	31,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
265	________	161	32,1	POL, Frame, $/Unit of Activity
	________	162	32,2	" Propulsion, "
	________	163	32,3	" Guid/Contr, "
	________	164	32,4	" Fire Contr, "
	________	165	32,5	" Armament, "
270	________	166	32,6	" Payload/Ammo, "
	________	167	32,7	" TBS, "
	________	168	32,8	" Pec Spt, "
	________	169	32,9	" Com Spt, "
	________	170	32,10	" Other, "
275	________	171	35,1	Labor Cost, OH, Frame, M$/OH
	________	172	35,2	" Propulsion, M$/OH
	________	173	35,3	" Guid/Contr, "
	________	174	35,4	" Fire Contr, "
	________	175	35,5	" Armament, "
280	________	176	35,6	" Payload/Ammo, "
	________	177	35,7	" TBS, "
	________	178	35,8	" Pec Spt, "
	________	179	35,9	" Com Spt, "
	________	180	35,10	" Other, "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
285	______	181	36,1	Materiel Cost, OH, Frame, M$/OH
	______	182	36,2	" Propulsion, M$/OH
	______	183	36,3	" Guid/Contr "
	______	184	36,4	" Fire Contr "
	______	185	36,5	" Armament "
290	______	186	36,6	" Payload/Ammo "
	______	187	36,7	" TBS "
	______	188	36,8	" Pec Spt "
	______	189	36,9	" Com Spt "
	______	190	36,10	" Other "
295	______	191	37,1	Transportation Cost, OH, Frame, $/Ton-Mile
	______	192	37,2	" Propulsion "
	______	193	37,3	" Guid/Contr "
	______	194	37,4	" Fire Contr "
	______	195	37,5	" Armament "
300	______	196	37,6	" Payload/Ammo "
	______	197	37,7	" TBS "
	______	198	37,8	" Pec Spt "
	______	199	37,9	" Com Spt "
	______	200	37,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
305	________	201	40,1	Maint, Civ Labor, Frame, M$/MAN
	________	202	40,2	" " Propulsion, M$/MAN
	________	203	40,3	" " Guid/Contr "
	________	204	40,4	" " Fire Contr "
	________	205	40,5	" " Armament "
310	________	206	40,6	" " Payload/Ammo "
	________	207	40,7	" " TBS "
	________	208	40,8	" " Pec Spt "
	________	209	40,9	" " Com Spt "
	________	210	40,10	" " Other "
315	________	211	41,1	Other Direct Cost, Frame, M$/YR
	________	212	41,2	" Propulsion, M$/YR
	________	213	41,3	" Guid/Contr "
	________	214	41,4	" Fire Contr "
	________	215	41,5	" Armament "
320	________	216	41,6	" Payload/Ammo "
	________	217	41,7	" TBS "
	________	218	41,8	" Pec Spt "
	________	219	41,9	" Com Spt "
	________	220	41,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
325	________	221	43,7	Personnel Repl Cost, TBS, M$/MAN
	________	222	43,10	" Other, "
	________	223		R
	________	224		R
	________	225	45,7	Qtr, Maint, Util Cost, TBS, M$/MAN
330	________	226	45,10	" Other "
	________	227		R
	________	228		R
	________	229	46,7	Medical Spt Cost, TBS, M$/MAN
	________	230	46,10	" Other "
335	________	231	47,1	Other Indirect Cost, Frame, M$/YR
	________	232	47,2	" Propulsion, M$/YR
	________	233	47,3	" Guid/Contr "
	________	234	47,4	" Fire Contr "
	________	235	47,5	" Armament "
340	________	236	47,6	" Payload/Ammo "
	________	237	47,7	" TBS, "
	________	238	47,8	" Pec Spt "
	________	239	47,9	" Com Spt "
	________	240	47,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
345	________	241		R
	________	242		R
	________	243		R
	________	244		R
	________	245		R
350	________	246	33,6	Unit Tng, Ammo, Missiles, Payload/Ammo, $/Unit Ec
	________	247	33,7	" TBS, "
	________	248		R
	________	249		R
	________	250	33,10	Unit Tng, Ammo, Missiles, Other "
355	________	251		R
	________	252		R
	________	253		R
	________	254		R
	________	255		
360	________	256	26,7	Crew Base P & A, TBS, M$/MY
	________	257	26,10	" - Other, M$/MY
	________	258	27,7	Maint Base P & A, TBS "
	________	259	27,10	" Other "
	________	260	28,7	Indirect Base P & A, TBS "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION	
365	______	261	28,10	Indirect Base P & A, Other, M$/MY	
	______	262	26,7	Crew Theater Cost, TBS	"
	______	263	26,10	" Other	"
	______	264	27,7	Maint Theater Cost, TBS	"
	______	265	27,10	" Other	"
370	______	266	28,7	Indirect Theater Cost, TBS	"
	______	267	28,10	" Other	"
	______	268	26,7	Crew Flight Pay, TBS	"
	______	269	26,10	" Other	"
	______	270	27,7	Maint Flight Pay, TBS	"
375	______	271	27,10	" Other	"
	______	272		R	
	______	273		R	
	______	274	29,7	PCS Cost, TBS	"
	______	275	29,10	" Other	"
380	______	276		R	
	______	277		R	
	______	278		R	
	______	279		R	
	______	280		R	
385	______	281		R	
	______	282		R	
	______	283		R	
	______	284		R	
	______	285			

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
400	XN			
405	______	1	2,1	Devel Engr, Frame, Number of MY
	______	2	2,2	" Propulsion "
	______	3	2,3	" Guid/Contr "
	______	4	2,4	" Fire Control "
	______	5	2,5	" Armament "
410	______	6	2,6	" Payload/Ammo "
	______	7	2,7	" TBS, "
	______	8	2,8	" Pec Spt "
	______	9	2,9	" Com Spt "
	______	10	2,10	" Other "
415	______	11	5,1	Proto Mfg, Frame, QTY PROTO
	______	12	5,2	" Propulsion, QTY PROTO
	______	13	5,3	" Guid/Contr "
	______	14	5,4	" Fire Control "
	______	15	5,5	" Armament "
420	______	16	5,6	" Payload/Ammo "
	______	17	5,7	" TBS "
	______	18	5,8	" Pec Spt "
	______	19	5,9	" Com Spt "
	______	20	5,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION		
425	________	21	7,1	Syst, Test, Eval,	Frame,	QTY TEST PERIODS
	________	22	7,2	"	Propulsion	"
	________	23	7,3	"	Guid/Contr	"
	________	24	7,4	"	Fire Control	"
	________	25	7,5	"	Armament	"
430	________	26	7,6	"	Payload/Ammo	"
	________	27	7,7	"	TBS	"
	________	28	7,8	"	Pec Spt	"
	________	29	7,9	"	Com Spt	"
	________	30	7,10	"	Other	"

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION			
435	________	31	8,1	Syst/Proj Mgt,	Frame, Number	of MY,	Govt
	________	32	8,1	"	Frame	"	Contr
	________	33	8,2	"	Propulsion	"	Govt
	________	34	8,2	"	Propulsion	"	Contr
	________	35	8,3	"	Guid/Contr	"	Govt
440	________	36	8,3	"	Guid/Contr	"	Contr
	________	37	8,4	"	Fire Control	"	Govt
	________	38	8,4	"	Fire Control	"	Contr
	________	39	8,5	"	Armament	"	Govt
	________	40	8,5	"	Armament	"	Contr
445	________	41	8,6	"	Payload/Ammo	"	Govt
	________	42	8,6	"	Payload/Ammo	"	Contr
	________	43	8,7	"	TBS	"	Govt
	________	44	8,7	"	TBS	"	Contr
	________	45	8,8	"	Pec Spt	"	Govt
450	________	46	8,8	"	Pec Spt	"	Contr
	________	47	8,9	"	Com Spt	"	Govt
	________	48	8,9	"	Com Spt	"	Contr
	________	49	8,10	"	Other	"	Govt
	________	50	8,10	"	Other	"	Contr

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
455	________	51	9,1	Training, Frame, Number MY
	________	52	9,1	" Frame, Qty Tng Sets
	________	53	9,2	" Propulsion, Number MY
	________	54	9,2	" Propulsion, Qty Tng Sets
	________	55	9,3	" Guid/Contr, Number MY
460	________	56	9,3	" Guid/Contr, Qty Tng Sets
	________	57	9,4	" Fire Control, Number MY
	________	58	9,4	" Fire Control, Qty Tng Sets
	________	59	9,5	" Armament, Number MY
	________	60	9,5	" Armament, Qty Tng Sets
465	________	61	9,6	" Payload/Ammo, Number MY
	________	62	9,6	" Payload/Ammo, Qty Tng Sets
	________	63	9,7	" TBS, Number MY
	________	64	9,7	" TBS, Qty Tng Sets
	________	65	9,8	" Pec Spt, Number MY
470	________	66	9,8	" Pec Spt, Qty Tng Sets
	________	67	9,9	" Com Spt, Number MY
	________	68	9,9	" Com Spt, Qty Tng Sets
	________	69	9,10	" Other, Number My
	________	70	9,10	" Other, Qty Tng Sets

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION		
475	______	71		R		
	______	72		R		
	______	73		R		
	______	74		R		
	______	75		R		
480	______	76		R		
	______	77		R		
	______	78		R		
	______	79		R		
	______	80		R		
485	______	81	14,1	Production,	Frame, NO. OF	MY, Engr
	______	82	14,2	"	Propulsion	"
	______	83	14,3	"	Guid/Contr	"
	______	84	14,4	"	Fire Control	"
	______	85	14,5	"	Armament	"
490	______	86	14,6	"	Payload/Ammo	"
	______	87	14,7	"	TBS	"
	______	88	14,8	"	Pec Spt	"
	______	89	14,9	"	Com Spt	"
	______	90	14,10	"	Other	"

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
495	________	91	14,1	Production, Frame, No. of MY, QC
	________	92	14,2	" Propulsion "
	________	93	14,3	" Guid/Contr "
	________	94	14,4	" Fire Contr "
	________	95	14,5	" Armament "
500	________	96	14,6	" Payload/Ammo "
	________	97	14,7	" TBS "
	________	98	14,8	" Pec Spt "
	________	99	14.9	" Com Spt "
	________	100	14,10	" Other "
505	________	101	14,1	" Frame, QTY MF'D (see note)
	________	102	14,2	" Propulsion "
	________	103	14,3	" Guid/Contr "
	________	104	14,4	" Fire Contr "
	________	105	14,5	" Armament "
510	________	106	14,6	" Payload/Ammo "
	________	107	14,7	" TBS "
	________	108	14,8	" Pec Spt "
	________	109	14,9	" Com Spt "
	________	110	14,10	" Other "
515	________	111	16,1	Syst Test, Eval, Frame, QTY TEST PERIODS
	________	112	16,2	" Propulsion "
	________	113	16,3	" Guid/Contr "
	________	114	16,4	" Fire Contr "
	________	115	16,5	" Armament "

NOTE: Variables XN(101) through XN(110) are for the quantity to the Army, not including previous buys.

EXAMPLE: Army buys 1,000 airframes, after another service has already bought 100 airframes. Thus, the Army buys airframes numbered 101 through 1101.

SOLUTION: XN(101) = 1000
PB(11) = 100 (See Figure 5 of User's Guide Volume 1)

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
520	______	116	16,6	Syst Test, Eval, Payload/Ammo, QTY TEST PERIODS
	______	117	16,7	" TBS "
	______	118	16,8	" Pec Spt "
	______	119	16,9	" Com Spt "
	______	120	16,10	" Other "
525	______	121	18,1	Syst/Proj Mgt, Frame, QTY GOV MY
	______	122	18,1	" Frame, QTY CONTR MY
	______	123	18,2	" Propulsion, QTY GOV MY
	______	124	18,2	" Propulsion, QTY CONTR MY
	______	125	18,3	" Guid/Contr, QTY GOV MY
530	______	126	18,3	" Guid/Contr, QTY CONTR MY
	______	127	18,4	" Fire Contr, QTY GOV MY
	______	128	18,4	" Fire Contr, QTY CONTR MY
	______	129	18,5	" Armament, QTY GOV MY
	______	130	18,5	" Armament, QTY CONTR MY
535	______	131	18,6	" Payload/Ammo, QTY GOV MY
	______	132	18,6	" Payload/Ammo, QTY CONTR MY
	______	133	18,7	" TBS, QTY GOV MY
	______	134	18,7	" TBS, QTY CONTR MY
	______	135	18,8	" Pec Spt, QTY GOV MY
540	______	136	18,8	" Pec Spt, QTY CONTR MY
	______	137	18,9	" Com Spt, QTY GOV MY
	______	138	18,9	" Com Spt, QTY CONTR MY
	______	139	18,10	" Other, QTY GOV MY
	______	140	18,10	" Other, QTY CONTR MY

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
545	____________	141	20,1	Training, Frame, Number MY
	____________	142	20,2	" Propulsion "
	____________	143	20,3	" Guid/Contr "
	____________	144	20,4	" Fire Contr "
	____________	145	20,5	" Armament "
550	____________	146	20,6	" Payload/Ammo "
	____________	147	20,7	" TBS "
	____________	148	20,8	" Pec Spt "
	____________	149	20,9	" Com Spt "
	____________	150	20,10	" Other "
555	____________	151	20,1	Training, Frame, Qty Tng Sets
	____________	152	20,2	" Propulsion "
	____________	153	20,3	" Guid/Contr "
	____________	154	20,4	" Fire Contr "
	____________	155	20,5	" Armament "
560	____________	156	20,6	" Payload/Ammo "
	____________	157	20,7	" TBS "
	____________	158	20,8	" Pec Spt "
	____________	159	20,9	" Com Spt "
	____________	160	20,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
565	________	161	22,1	Transportation, Frame, Qty Transported
	________	162	22,2	" Propulsion "
	________	163	22,3	" Guid/Contr "
	________	164	22,4	" Fire Contr "
	________	165	22,5	" Armament "
570	________	166	22,6	" Payload/Ammo "
	________	167	22,7	" TBS "
	________	168	22,8	" Pec Spt "
	________	169	22,9	" Com Spt "
	________	170	22,10	" Other "
575	________	171		R
	________	172		R
	________	173		R
	________	174		R
	________	175		R
580	________	176		R
	________	177		R
	________	178		R
	________	179		R
	________	180		R

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
				(Also, other O&S cells in
585	________	181	31,1	Qty Opn'l, Frames same column)
	________	182	31,2	" Propulsion
	________	183	31,3	" Guid/Contr
	________	184	31,4	" Fire Control
	________	185	31,5	" Armament
590	________	186	31,6	" Payload/Ammo
	________	187	26,7	" TBS
	________	188	31,8	" Pec Spt
	________	189	31,9	" Com Spt
	________	190	26,10	" Other
595	________	191	26,7	Number Crew per TBS
	________	192	26,10	Number Crew per Other
	________	193	27,7	Number Maint Men, TBS
	________	194	27,10	Number Maint Men, Other
	________	195	28,7	Number of Indirect Men, TBS
600	________	196	28,10	Number of Indirect Men, Other
	________	197	R	
	________	198	R	
	________	199	R	
	________	200	R	

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
605	____________	201	31,1	Yearly activity (FH, miles, etc), Frame
	____________	202	31,2	" Propulsion
	____________	203	31,3	" Guid/Contr
	____________	204	31,4	" Fire Contr
	____________	205	31,5	" Armament
610	____________	206	31,6	" Payload/Ammo
	____________	207	31,7	" TBS
	____________	208	31,8	" Pec Spt
	____________	209	31,9	" Com Spt
	____________	210	31,10	" Other
615	____________	211	40,1	No. Civ Maint Men per Opn'l Frame
	____________	212	40,2	" Propulsion
	____________	213	40,3	" Guid/Contr
	____________	214	40,4	" Fire Control
	____________	215	40,5	" Armament
620	____________	216	40,6	" Payload/Ammo
	____________	217	40,7	" TBS
	____________	218	40,8	" Pec Spt
	____________	219	40,9	" Com Spt
	____________	220	40,10	" Other
625	____________	221		R
	____________	222		R
	____________	223		R
	____________	224		R
	____________	225		R

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
700	UC			
705		1	5,1	1st unit cost, Proto Mfg, Frame, M$
		2	5,2	" Propulsion, M$
		3	5,3	" Guid/Contr "
		4	5,4	" Fire Control "
		5	5,5	" Armament "
710		6	5,6	" Payload/Ammo "
		7	5,7	" TBS "
		8	5,8	" Pec Spt "
		9	5,9	" Com Spt "
		10	5,10	" Other "
715		11	14,1	1st unit cost production, Frame, M$
		12	14,2	" Propulsion, M$
		13	14,3	" Guid/Contr "
		14	14,4	" Fire Control "
		15	14,5	" Armament "
720		16	14,6	" Payload/Ammo "
		17	14,7	" TBS "
		18	14,8	" Pec Spt "
		19	14,9	" Com Spt "
		20	14,10	" Other "

EXAMPLE: A CER predicts the cumulative average cost of airframes at unit 1000. The cum avg theory is used: $Y = aX^b$ where Y = cum avg cost at quantity X, a = first unit cost, X = cumulative quantity, and b = log(slope)/log(2). If the CER estimates a cum avg cost (at unit 1000) of .25 million dollars, find the first unit cost. Assume a slope of 90%.

SOLUTION:
$Y = aX^b$
$a = Y/X^b$
$a = .25/1000^b$
$a = .25/1000^{-.1521}$
a = .715 million dollars

$$\left\{\begin{array}{l} \log(.90) = -.1054 \\ \log(2) = .6931 \\ b = -.1054/.6931 \\ b = -.1521 \end{array}\right.$$

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
725	EC			
730	______	1	5,1	Slope, Proto Mfg, Frame, as decimal fraction
	______	2	5,2	" Propulsion "
	______	3	5,3	" Guid/Contr "
	______	4	5,4	" Fire Control "
	______	5	5,5	" Armament "
735	______	6	5,6	" Payload/Ammo "
	______	7	5,7	" TBS "
	______	8	5,8	" Pec Spt "
	______	9	5,9	" Com Spt "
	______	10	5,10	" Other "
740	______	11	14,1	Slope, Prod Mfg, Frame "
	______	12	14,2	" Propulsion "
	______	13	14,3	" Guid/Contr "
	______	14	14,4	" Fire Control "
	______	15	14,5	" Armament "
745	______	16	14,6	" Payload/Ammo "
	______	17	14,7	" TBS "
	______	18	14,8	" Pec Spt "
	______	19	14,9	" Com Spt "
	______	20	14,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
750	PB			
755	______	1		R
	______	2		R
	______	3		R
	______	4		R
	______	5		R
760	______	6		R
	______	7		R
	______	8		R
	______	9		R
	______	10		R
765	______	11	14,1	Prev Buy Prod, Frame
	______	12	14,2	" Propulsion
	______	13	14,3	" Guid/Contr
	______	14	14,4	" Fire Control
	______	15	14,5	" Armament
770	______	16	14,6	" Payload/Ammo
	______	17	14,7	" TBS
	______	18	14,8	" Pec Spt
	______	19	14,9	" Com Spt
	______	20	14,10	" Other

NOTE: This block, like any data block, may be deleted entirely. But if any part is used, the whole block must be present.

EXAMPLE: Army buys 1,000 airframes, after another service has already bought 100 airframes. Thus, the Army buys airframes numbered 101 through 1101.

SOLUTION: XN(101) = 1000
PB(11) = 100 (See Figure 5 of User's Guide, Vol I)

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
800	CF			
805	______	1	17,1	Data, percent of all other inv cost, Frame
	______	2	17,2	" Propulsion
	______	3	17,3	" Guid/Contr
	______	4	17,4	" Fire Control
	______	5	17,5	" Armament
810	______	6	17,6	" Payload/Ammo
	______	7	17,7	" TBS
	______	8	17,8	" Pec Spt
	______	9	17,9	" Com Spt
	______	10	17,10	" Other
815	______	11	14,1	Tooling. Frame, percent of Mfg
	______	12	14,2	" Propulsion "
	______	13	14,3	" Guid/Contr "
	______	14	14,4	" Fire Control "
	______	15	14,5	" Armament "
820	______	16	14,6	" Payload/Ammo "
	______	17	14,7	" TBS "
	______	18	14,8	" Pec Spt "
	______	19	14,9	" Com Spt "
	______	20	14,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
825	______	21	15,1	Engineering changes, Frame, percent of row 14
	______	22	15,2	" Propulsion "
	______	23	15,3	" Guid Contr "
	______	24	15,4	" Fire Control "
	______	25	15,5	" Armament "
830	______	26	15,6	" Payload/Ammo "
	______	27	15,7	" TBS "
	______	28	15,8	" Pec Spt "
	______	29	15,9	" Com Spt "
	______	30	15,10	" Other "
835	______	31	20,1	Training, Spares, Frame, percent of Sets cost
	______	32	20,2	" Propulsion "
	______	33	20,3	" Guid Contr "
	______	34	20,4	" Fire Control "
	______	35	20,5	" Armament "
840	______	36	20,6	" Payload/Ammo "
	______	37	20,7	" TBS "
	______	38	20,8	" Pec Spt "
	______	39	20,9	" Com Spt "
	______	40	20,10	" Other "

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
845	________	41	21,1	Initial Spares & Repair Parts, Frame, % of Prod
	________	42	21,2	" Propulsion "
	________	43	21,3	" Guid Contr "
	________	44	21,4	" Fire Contr "
	________	45	21,5	" Armament "
850	________	46	21,6	" Payload/Ammo, "
	________	47	21,7	" TBS "
	________	48	21,8	" Pec Spt "
	________	49	21,9	" Com Spt "
	________	50	21,10	" Other "
855	________	51		R
	________	52		R
	________	53		R
	________	54		R
	________	55		R
860	________	56		R
	________	57		R
	________	58		R
	________	59		R
	________	60		R

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
865	______	61	38,1	Modifications, Frame, annual % of prod cost
	______	62	38,2	" Propulsion "
	______	63	38,3	" Guid/Contr "
	______	64	38,4	" Fire Contr "
	______	65	38,5	" Armament "
870	______	66	38,6	" Payload/Ammo "
	______	67	38,7	" TBS "
	______	68	38,8	" Pec Spt "
	______	69	38,9	" Com Spt "
	______	70	38,10	" Other "
875	______	71		R
	______	72		R
	______	73	43,7	Personnel Replacement, TBS, Annual attrition rate
	______	74	43,10	" Other "
	______	75	44,7	TPP Factor, TBS
880	______	76	44,10	TPP Factor, Other
	______	77		R
	______	78		R
	______	79		R
	______	80		R

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
900	PC			
905	______	1		R
	______	2		R
	______	3		R
	______	4		R
	______	5		R
910	______	6		R
	______	7		R
	______	8		R
	______	9		R
	______	10		R
915	______	11	35,1	Act (FH,miles,etc) between overhauls, Frame
	______	12	35,2	" Propulsion
	______	13	35,3	" Guid/Contr
	______	14	35,4	" Fire Contro
	______	15	35,5	" Armament
920	______	16	35,6	" Payload/Amm
	______	17	35,7	" TBS
	______	18	35,8	" Pec Spt
	______	19	35,9	" Com Spt
	______	20	35,10	" Other

(Note: Same PC's also used, rows 36 and 37)

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
925	________	21	37,1	Transportation to depot, Frame, Tons
	________	22	37,2	" Propulsion
	________	23	37,3	" Guid/Contr
	________	24	37,4	" Fire Control
	________	25	37,5	" Armament
930	________	26	37,6	" Payload/Ammo
	________	27	37,7	" TBS
	________	28	37,8	" Pec Spt
	________	29	37,9	" Com Spt
	________	30	37,10	" Other
935	________	31	37,1	Transp to depot, distance in miles, Frame
	________	32	37,2	" Propulsion
	________	33	37,3	" Guid/Contr
	________	34	37,4	" Fire Control
	________	35	37,5	" Armament
940	________	36	37,6	" Payload/Ammo
	________	37	37,7	" TBS
	________	38	37,8	" Pec Spt
	________	39	37,9	" Com Spt
	________	40	37,10	" Other
945	________	41		R
	________	42		R
	________	43		R
	________	44		R
	________	45		R

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
955		YN		
960			1	Number of years buildup, O&S phase
			2	Number of years level operation, O&S phase
			3	Number of years phasedown, O&S phase
			4	R
			5	Service life, years

Note: Use either a) YN(1) and YN(2) and YN(3), or b) YN(5), not both.

LINE NO.	VALUE	VARIABLE	CELL	DESCRIPTION
970	SF			
975	______	1		Constant Dollar Shift Factor, RDT&E
	______	2		" Proc Acft
	______	3		" Proc Missiles
	______	4		" Proc Weapons
	______	5		" Proc Ammo
980	______	6		" Proc Other
	______	7		" OMA
	______	8		" MPA
	______	9		" MCA
	______	10		" FHMA
985	______	11		" ERDA
	______	12		R
	______	13		R
	______	14		R
	______	15		R

LINE NO.				DESCRIPTION
1000	THRUPUTS			(To be defined by analyst)
1010	ROW	COL	AMT	
1020	___	___	___	
1030	___	___	___	
1040	___	___	___	
1050	___	___	___	
1060	___	___	___	

NOTE: Enter amounts in millions of dollars of the input base year. The amounts will be multiplied by the shift factors.

4.3 Cost Definitions Input. If the analyst asks for Report 2, the program will ask for the name of the definition main file. This main file works together with definition satellite files to produce Hardware Cost, Flyaway Cost, or any other aggregation the analyst may choose to define. The main file (shown in Figure 10), tells the program what satellite files to use (shown in Figure 11). Thus, the analyst only has to name one file at run time, even though up to 15 different definition satellite files may be used. All files must follow the rules shown on the figures, and all files must be prepared before running the program. The line numbers on the samples are illustrative only, and the analyst can use any line numbers he wishes. Preprinted forms are at Figures 12 and 13.

SAMPLE DEFINITION MAIN FILE

```
KEYCOST

100  LABEL  LOCATION
110  HARDWARE  FILEAA
120  FLYAWAY FILEBB
130  WEAP-SYS FILECC
140  PROCMN'T FILEDD
150  PROGRAM FILEEE
```

Notes:

1. Line 100. Must be entered as shown.

2. Lines 110-150. Enter two alphanumeric words, each word up to eight characters. The first word appears as a label on the output. The second word identifies the definition satellite file which tells how to calculate the cost.

3. Line 150. Up to 15 different definitions may be used.

FIGURE 10

SAMPLE DEFINITION SATELLITE FILE

```
FILEAA

100  QTY  1000
110  ROW  COL  FRACTION
120  3  1  1.0
130  3  2  .5
```

Notes:

1. Line 100. Must be entered as shown, except that in place of 1000 enter the quantity you want to divide by.

2. Line 110. Must be entered as shown.

3. Lines 120-130. The first and second pieces of data designate the row and column containing the desired cost. The last entry is the fractional amount of that cost to take.

4. Line 130. Any number of data lines may be used.

FIGURE 11

DEFINITION MAIN FILE INPUT FORM

```
100  LABEL  LOCATION
110  _____  ________
120  _____  ________
etc.
```

FIGURE 12

DEFINITION SATELLITE FILE INPUT FORM

```
100  QTY  _____________
110  ROW  COL  FRACTION
120  ___  ___  ________
130  ___  ___  ________
etc.
```

FIGURE 13

4.4 Appropriation Input. If the analyst asks for reports 3,4,5,6,7 or 8, the program will ask at run time for the name of the appropriation file. This file specifies which budget funding category will pay for each cost element in the Army Life Cycle Cost Matrix. For convenience, the model assigns appropriations row by row (using column 11, total), rather than cell by cell. If a cost element requires several appropriations (for example, row 31, Replenishment Spares), then that row may be split among several appropriations by assigning fractions of the row to each of the required appropriations, as shown in Figure 14. For example, row 1, (Total R&D) may be assigned to appropriation 1, RDT&E, while row 47 (Other Indirect) may be split fractionally among OMA, MPA and FHMA. The input form lists the appropriations recognized by the model and their respective codes. Figure 14 is a sample appropriation file in which row 1 (total R&D) has been split into appropriations 1 and 3. The analyst could have obtained the same result by assigning appropriations to each of rows 2 through 11. Whether the analyst assigns appropriations to total rows or to primary rows, he must account for exactly 100% of the life cycle cost. A preprinted form follows at Figure 15.

SAMPLE APPROPRIATION FILE

```
FUNDING

100  ROW  CODE  FRACTION
110  1  1  .50
120  1  3  .50
```

Notes:

1. Line 100. Must be entered as shown.

2. Line 110. The first data entry names the row containing the cost. The second data entry gives the appropriation, using the following codes:

   CODE - APPROPRIATION

1	RDT&E
2	PROC, AC
3	PROC, MSL
4	PROC, WPN
5	PROC, AMMO
6	PROC, OTHER
7	OMA
8	MPA
9	MCA
10	FHMA
11	NOT USED
12	ERDA

   The third data entry gives the fraction of the total cost (of the named row) which is to be assigned to the given appropriation. Line 110 assigns 50% of the cost of row 1 (total R&D) to appropriation code 1, (RDT&E).

3. Line 120. Line 120 assigns 50% of the cost of row 1 (total R&D) to appropriation code 3 (Procurement of Missiles). The analyst can address any rows (either totals or primary rows) as long as exactly 100% of the life cycle cost is accounted for. The analyst may use as many data lines as he needs to accomplish this.

FIGURE 14

APPROPRIATION INPUT FORM

LINE NO.			
100	ROW	CODE	FRACTION
110	___	___	______
120	___	___	______
130	___	___	______
140	___	___	______
150	___	___	______
160	___	___	______
170	___	___	______
180	___	___	______
etc			

CODE - APPROPRIATION	
1	RDT&E
2	PROC, AC
3	PROC, MSL
4	PROC, WPN
5	PROC, AMMO
6	PROC, OTHER
7	OMA
8	MPA
9	MCA
10	FHMA
11	NOT USED
12	ERDA

FIGURE 15

4.5 Time Phasing Input. If the analyst asks for reports 4,5,6,7 or 8, the program will ask at run time for the name of the time phasing file (also the inflation file and the appropriation file). The time phasing file instructs the computer how to spread over time the constant dollar amounts of Report 3 (Appropriation by Life Cycle Phase), giving time phased reports in constant dollars (Reports 4 and 5) and current dollars (Reports 6 and 7). It is important for the analyst to understand how the program calculates the constant dollar Reports 4 and 5 from Report 3, and then how the program calculates the current dollar Reports 6 and 7 from the constant dollar Reports 4 and 5. This is explained in Chapter 3. The analyst also will have to study Figure 16 and the sample outputs in Appendix A to understand time phasing. At Figure 17 is a time phasing input form for one data block.

SAMPLE TIME PHASING INPUT FILE

```
SPREAD

100  PHASE  1
110  CODE  1
120  YEAR  AMOUNT
130  65  100
140  66  0
150  67  110.
160  68  0.
170  69  120.
180  70  0
190  71  120
200  72  0
210  73  120
220  74  0
230  YEAR  PERCENT
240  75  .10
250  76  .20
260  7T  .05
270  77  .25
280  78  .20
290  79  .10
300  80  .05
310  81  .05
320  CODE  3
330  YEAR  AMOUNT
340  65  0
350  66  0
360  67  0
370  68  0
380  69  0
390  70  0
400  71  0
410  72  0
420  73  0
430  74  0
440  YEAR  PERCENT
450  75  0
460  76  0
470  7T  0
480  77  .1
490  78  .1
500  79  .1
510  80  .1
520  81  .1
530  82  .2
540  83  .1
550  84  .1
560  85  .05
570  86  .05
```

Notes:

1. Lines 100-570. These lines illustrate one phase data block for life cycle phase 1 (R&D). The first line of a phase data block must be entered as in line 100, except that instead of 1, enter 1,2,3 or 4 for R&D, INV, O&S, or ERDA, respectively.

2. Lines 110-310. These lines illustrate one appropriation data block for code 1 (RDT&E). Within each phase data block the analyst must have an appropriation data block for every appropriation used in that phase. The first line of an appropriation data block must be entered as in line 110, except that instead of 1, enter the correct appropriation code (see Figure 17 for the codes).

3. Lines 120-220. These lines illustrate the amount section of an appropriation data block. The first line of the amount section must be entered as in line 120. Exactly ten data lines must follow as in lines 130-220. The first year must be the same in every amount section in the whole file. The amounts are in millions of <u>current</u> dollars.

4. Lines 230-310. These lines illustrate the percent section of an appropriation data block. The first line of the percent section must be entered as in line 230. Up to 28 data lines may follow as in lines 240-310, but the constant dollar percents in decimal form must add to 1.00.

FIGURE 16

TIME PHASING INPUT FORM
(For One Data Block)

____	CODE	__________
____	YEAR	AMOUNT
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	____	__________
____	YEAR	PERCENT
____	____	__________
____	____	__________

etc

CODE	APPROPRIATION
1	RDT&E
2	PROC, AC
3	PROC, MSL
4	PROC, WPN
5	PROC, AMMO
6	PROC, OTHER
7	OMA
8	MPA
9	MCA
10	FHMA
11	NOT USED
12	ERDA

FIGURE 17

4.6 Inflation Input. If the analyst asks for reports 4,5,6,7 or 8 the program will ask at run time for the name of the inflation main file. This file specifies, for each appropriation code used, the location of the inflation satellite file containing the composite indices for that appropriation. Figure 18 is a sample inflation main file and Figure 19 is a sample inflation satellite file. Figures 20 and 21 are the corresponding blank input forms. A utility program normally writes the inflation satellite files, based on price indices and outlay rates. This program is described in Appendix B together with a discussion of composite indices, price indices and outlay rates. The input forms are provided in case the analyst chooses to create his own inflation satellite files.

SAMPLE INFLATION MAIN FILE

```
INDICES

100 APPROP  LOCATION
110 1  RDFILE
120 3  PROCFILE
```

Notes:

1. Line 100. The first line must be entered as shown.

2. Lines 110-120. The first data entry gives the appropriation code using the following codes:

   CODE - APPROPRIATION

1	RDT&E
2	PROC, AC
3	PROC, MSL
4	PROC, WPN
5	PROC, AMMO
6	PROC, OTHER
7	OMA
8	MPA
9	MCA
10	FHMA
11	NOT USED
12	ERDA

   The second data entry names the file containing the composite indices for the given appropriation. Line 110 says that the composite indices for appropriation code 1 (RDT&E) are found in the file named "RDFILE." There must be one data line for every appropriation used.

FIGURE 18

SAMPLE INFLATION SATELLITE FILE

```
RDFILE

100  65  .70
110  66  .75
120  67  .80
130  68  .85
140  69  .90
150  70  .95
160  71  1.00
170  72  1.05
```

Notes:

1. Line 100. The first data entry identifies the year and is alphanumeric ("7T" is acceptable). The second data entry is the composite index.

2. Line 170. Any number of data lines may be entered (at least two are required). Missing indices are calculated by the program.

FIGURE 19

INFLATION MAIN FILE INPUT FORM

100	APPROP	LOCATION
110	______	________
120	______	________
etc		

CODE - APPROPRIATION

1	RDT&E
2	PROC, AC
3	PROC, MSL
4	PROC, WPN
5	PROC, AMMO
6	PROC, OTHER
7	OMA
8	MPA
9	MCA
10	FHMA
11	NOT USED
12	ERDA

FIGURE 20

INFLATION SATELLITE FILE INPUT FORM

100	______	________
110	______	________
etc		

FIGURE 21

4.7 Changing Row and Column Headings. Standard headings normally are used. If the analyst is satisfied with the standard headings he need not read this section. In case he wishes to change the labels on the cost elements, appropriations or column headings, he must create a substitute file for ROWST*, APPST* or COLST*, respectively, as described below. For each model (AIRCO, MICO and TRACO), a file is required, named AIRHD*, MICHD* or TRAHD*, respectively. This file has only one line, so it can be easily changed. Figure 22 shows the standard file for all models. The one line has a line number, the name of the file containing the row headings, the name of the file containing the appropriation headings, and the name of the file containing the column headings. The files containing the standard headings are named ROWST*, APPST* and COLST*. These files already exist and need not be created by the analyst. At run time the program reads AIRHD*, MICHD*, or TRAHD*, (depending on the model) then locates and reads the three files it names. Each of the three files must conform to its own exact format as described on the sample figures. The file containing the row headers must have exactly 50 lines, each with the format described on Figure 23. Leading and trailing blanks (in front of and in back of the words) must be entered. Figure 23 is the standard file and serves as a sample for row headers. The file containing the appropriation headers must have exactly 14 lines, each in the format described on Figure 24. Figure 24 is the standard file and serves as a sample file for appropriation headers. The file containing the column headings must have exactly 6 lines, each in the format of Figure 25. Leading and trailing blanks (in front of and in back of the words) must be entered. Lines 1-4 will appear as column headings on Report 1 and lines 5 and 6 will appear as the early years and the later years, respectively, on the time-phased reports. Figure 25 is the standard file and serves as an example for column headers. Preprinted input forms follow at Figures 26, 27, 28 and 29.

SAMPLE MAIN HEADER FILE

100 ROWST* APPST* COLST*

Notes:

1. Line 100. Only one line. First data entry gives the name of the file containing row headers (standard file is named ROWST*. Second data entry gives the name of the file containing appropriation headers (standard file is named APPST*). Third data entry gives the name of the file containing column headers (standard file is named COLST*). Any or all data entries may be changed.

FIGURE 22

SAMPLE ROW HEADERS FILE

```
101 RES & DEVELOPMENT
102   DEVELOPMENT ENGR
103   PEP
104   TOOLING
105   PROTOTYPE MANUF
106   DATA
107   SYS TEST & EVAL
108   SYS/PROJECT MGT
109   TRAINING
110   FACILITIES
111   OTHER
112 INVESTMENT
113   NON-RECURRING INV
114   PRODUCTION
115   ENGR CHANGES
116   SYS TEST & EVAL
117   DATA
118   SYS/PROJECT MGT
119   OPN'L/SITE ACT
120   TRAINING
121   INIT SP & REP PTS
122   TRANSPORTATION
123   OTHER
124 OPERATING AND SPT
125   MIL PERSONNEL
126     CREW P&A
127     MAINT P&A
128     INDIRECT P&A
129     PCS
130   CONSUMPTION
131     REPL SPARES
132     POL
133     UNT TNG AMMO/MSL
134   DEPOT MAINTENANCE
135     LABOR
136     MATERIEL
137     TRANSPORTATION
138   MODIFICATIONS
139   OTHER DIR SPT OPNS
140     MAINT, CIV LABOR
141     OTHER DIRECT
142   INDIRECT SPT OPNS
143     PERSONNEL REPL
144     TPP
145     QTRS, MAINT/UTIL
146     MEDICAL SUPPORT
147     OTHER INDIRECT
148 TOTAL, LESS ERDA
149 ERDA
150 TOTAL
```

Notes:

1. All lines. Must conform to following format: 3 integers, 1 blank, and 24 alphanumeric.

FIGURE 23

SAMPLE APPROPRIATION HEADERS FILE

```
101  RDT&E..................
102  PROC, AC...............
103  PROC, MSL..............
104  PROC, WPN..............
105  PROC, AMMO.............
106  PROC, OTHER............
107  OMA....................
108  MPA....................
109  MCA....................
110  FHMA...................
111    TOTAL, LESS ERDA......
112  ERDA...................
113    TOTAL................
114    PERCENT..............
```

Notes:

1. All lines. Must conform to following format: 3 integers, 1 blank, and 24 alphanumeric.

FIGURE 24

SAMPLE COLUMN HEADERS FILE

```
COLS1*

1                 \SYSTEM                       GUID                                (TO BE    PEC      COMMON
2                 \STRUC-    FRAME   PRO-       CONTR/  FIRE      ARMA-   PAYLOAD  SPECI-    SPT      SUPPORT OTHER     TOTAL   PER-
3                  \TURE             PULSION    COMMO   CONTROL   MENT    /AMMO    FIED)     EQUIP    EQUIP                     CENT
4     COST ELEMENT \          (1)     (2)       (3)      (4)      (5)      (6)      (7)       (8)      (9)     (10)      (11)    (12)
5                  65     66     67     68      69      70       71       72       73     74      75       76       7T        77      76
6                  79     80     81     82      83      84       85       86       87     88      89       90       91        92   TOTAL
```

Notes:

1. All lines. Must conform to following format: 1 integer, 1 blank space, 116 alphanumeric characters. First four lines appear on Report 1 and last two lines appear on all time-phasing reports.

FIGURE 25

MAIN HEADER INPUT FORM

100 ________ ________ ________

FIGURE 26

ROW HEADERS INPUT FORM

```
    Counter:
    123456789012345678901234
101b̸-----------------------
102b̸-----------------------
103b̸-----------------------
104b̸-----------------------
105b̸-----------------------
106b̸-----------------------
107b̸-----------------------
108b̸-----------------------
109b̸-----------------------
110b̸-----------------------
111b̸-----------------------
112b̸-----------------------
113b̸-----------------------
114b̸-----------------------
115b̸-----------------------
116b̸-----------------------
117b̸-----------------------
118b̸-----------------------
119b̸-----------------------
120b̸-----------------------
121b̸-----------------------
122b̸-----------------------
123b̸-----------------------
124b̸-----------------------
125b̸-----------------------
```

```
    Counter:
    123456789012345678901234
126b̸-----------------------
127b̸-----------------------
128b̸-----------------------
129b̸-----------------------
130b̸-----------------------
131b̸-----------------------
132b̸-----------------------
133b̸-----------------------
134b̸-----------------------
135b̸-----------------------
136b̸-----------------------
137b̸-----------------------
138b̸-----------------------
139b̸-----------------------
140b̸-----------------------
141b̸-----------------------
142b̸-----------------------
143b̸-----------------------
144b̸-----------------------
145b̸-----------------------
146b̸-----------------------
147b̸-----------------------
148b̸-----------------------
149b̸-----------------------
150b̸-----------------------
```

Notes:

1. The symbol "b̸" denotes a blank.

2. All characters, including blanks, must be typed into the file.

FIGURE 27

APPROPRIATION HEADERS INPUT FORM

```
       Counter:
       123456789012345678901234
101b---------------------
102b---------------------
103b---------------------
104b---------------------
105b---------------------
106b---------------------
107b---------------------
108b---------------------
109b---------------------
110b---------------------
111b---------------------
112b---------------------
113b---------------------
114b---------------------
```

Notes:

1. The symbol "b" denotes a blank character.
2. All characters, including blank characters, must be typed into the file.

FIGURE 28

COLUMN HEADERS INPUT FORM

```
    Counter:
    123456789012345678901234567890123456789012345678901234567890

1b̸ ------------------------------------------------------------

    ------------------------------------------------------------

2b̸ ------------------------------------------------------------

    ------------------------------------------------------------

3b̸ ------------------------------------------------------------

    ------------------------------------------------------------

4b̸ ------------------------------------------------------------

    ------------------------------------------------------------

5b̸ ------------------------------------------------------------

    ------------------------------------------------------------

6b̸ ------------------------------------------------------------

    ------------------------------------------------------------
```

Notes:

1. The symbol "b̸" denotes a blank character.

2. All characters, including all blanks, must be typed into the file.

FIGURE 29

4.8 Run Time Procedures. This section gives detailed procedures for entering the time sharing system, and a brief description of some of the commands available. A sign-on with a program run is shown at Figure 30. Sign-on procedures are as follows:

a. Turn machine on, using the white switch at the right rear.

b. Put on STANDBY, set speed at 30, transparency at OFF, inhibit at NORM, line space at 1 and auto LF at OFF.

c. Verify that the telephone cradle clamp is in a raised position.

d. Dial 9-340-4800.

e. At the sound of the high-pitched tone, clamp the phone into the coupler with the earpiece at the top.

f. Quickly (within 5 seconds) type HH and give RETURN.

g. The computer will ask for your user number by printing "U#=". Type in your user number (see the division programmer for the latest one) and give RETURN.

h. The computer will ask for your password by printing "PASSWORD" followed by a line of overprinted characters. Type in your password (see the division programmer for the latest one) and give RETURN.

i. In response to the question SYSTEM, type FIV (for FORTRAN IV). BAS (for BASIC) may also be used. Give RETURN.

j. In response to the question NEW or OLD, type any system command, for example, type NEW filename, OLD filename, RUN program, or BYE (see Table 3 for a brief description of some of the commands available).

SAMPLE SIGN-ON PROCEDURE

(Analyst's responses are in lower case and are underlined)

U# xx99 (see programmer for User No.)

PASSWORD (see programmer for Password)
xx99
SYSTEM - fiv

NEW OR OLD-

Sign-On

run model (Name of program changes periodically, see prompt card on terminal)

MODEL

NAME OF DATA INPUT FILE---? input

14 THRUPUTS HAVE BEEN ADDED, AND THE TOT AMT IS:

RAW: 2400.00000

SHIFTED: 2640.00000

NAME OF FILE TO STORE RESULTS---? costfile

RESULTS STORED IN COST FILE

One Run of Model

run reptgen (Name of program changes periodically, see prompt card on terminal)

REPTGEN

HOW MANY REPORTS, WHICH ONES---? 1,1

COST DATA FILE---? costfile

GIVE WORDS 1, 2 AND 3---? abcdefg 12345678 xxxxmmmm

ADJUST PAPER, GIVE RETURN, OUTPUT FOLLOWS

One Run of Report Generator

FIGURE 30

TABLE 3

SYSTEM COMMANDS

COMMAND	INTERPRETATION
BYE	End the session and disconnect the telephone line. Analyst must hang up the phone.
CAS	List the names of all the files saved under my user number. Note: Analyst <u>must</u> purge files no longer required.
EDIT DELETE 0-110	Remove all lines from line 0 up to and including line 110 from the file in the working area.
EDIT DELETE 110	Remove line 110 from the file in the working area.
EDIT LIST 110	List line 110 from the file in the working area.
EDIT LIST 99999	List the last line from the file in the working area, regardless of its actual line number.
HELLO	Ask the user for a new user number. This command allows another team to use the terminal without the need to hang up or redial the phone number.
LIST	List the file in the working area.
LIST filename	List the file named "filename" (which may or may not be in the working area.)
NEW filename	Clear the work area of all data, and give the work area the name "filename". The user normally will proceed to type in data.

TABLE 3

SYSTEM COMMANDS
(Continued)

COMMAND	INTERPRETATION
OLD filename	Search among the previously stored files and programs and find one named "filename". Make a copy of it and put the copy in the working area.
PURGE	Destroy the file in the working area and also the saved copy of it. Analysts must purge files no longer required (see CAS).
RENAME filename	Give the working area the name "filename".
REPLACE filename	Give the working area the name "filename" and also store a copy of the working area under the name "filename". Caution: The file formerly stored under that name has been replaced by the file now in the working area. The file formerly stored there is therefore lost.
RUN program	Find and run the program named "program".
SAVE	Make a copy of the file in the working area and store it for later retreival. Note: this file will remain saved until purged. Analysts must purge files no longer required (see PURGE).
110 DATA	Add a line of data to the file in the working area. No matter when typed, the line will be inserted in the correct numerical sequence. If there is already a line with that line number, the new line replaces it.

4.9 Changing the Equations in the Model. This section gives step by step procedures to change the equations in the Army Life Cycle Cost Model. Changes are accomplished in three steps. First, the analyst makes his own copy of the Army Life Cycle Cost Model. Second, he makes all his changes on the copy and stores listable and machine language forms of his own program. Third, he documents all the changes. Documentation is accomplished by marking up the blank data input forms and by preparing Cost Data Sheets (described in 4.2 and 2.3.2, respectively). The importance of documentation to the user cannot be overemphasized. The rest of this section shows an example in which the standard equation in cell A(2,1) is replaced by another equation. The standard equation calculates the cost of Development Engineering, Frame, as the number of manyears times the cost per manyear. The new equation calculates the cost as two times the cube root of the empty weight in pounds, times the rate of climb in feet per second (this CER is illustrative only). The analyst proceeds as follows:

a. First make a copy of the <u>listable</u> version of the Army Life Cycle Cost Model (the listable version is different from the <u>machine language</u> version the analyst normally runs). To accomplish this type "OLD MODEL*" where MODEL* is the name of the listable version (see the prompt card on the terminal for the latest program names).

b. Using the EDIT LIST command (see Table 3), find the line or lines to be changed. For example, suppose the standard equation appears on line 1000 as follows:

```
1000  A(2,1) = XN(1)*AC(1)*SF(1)
```

c. Type in the changes. The analyst must provide for the data input and for the algebraic calculations. In this example the program needs the empty weight (the analyst might choose the symbol EWT) and the rate of climb (denoted ROC). The analyst types as follows:

```
1000        PRINT, "GIVE EMPTY WT AND RATE OF CLIMB"
1010        INPUT, EWT, ROC
1020        A(2,1) = 2.0*(EWT)**.333*ROC*SF(1)
```

Line 1000 above replaces the old line 1000 and prints the request for data at run time. Line 1010 stops the program for the analyst to enter the two pieces of data at run time. Line 1020 does the algebra.

d. The analyst makes up a name (for example, MODEL2) to store the listable copy of his modified model. Type:

RENAME MODEL2
(Analyst must now wait for computer response of "READY")

e. Save this listable version for future reference by typing:

SAVE
(Analyst must now wait for computer response of "READY")

f. Make a machine language form of the modified program by typing:

```
RENAME      RUNMOD2
SAVE
LOAD        RUNMOD2
REPLACE     RUNMOD2
```
(After each command above, wait for "READY")

g. The analyst now has a stored machine language model. He might type "BYE" at this point, for example, and then come in the next day and type "RUN RUNMOD2". The program would run like the standard one except it would also stop and say:

GIVE EMPTY WT AND RATE OF CLIMB?

at which point the analyst might type 14273,150 and give a carriage return. When naming variables, choose names that begin with the letters A through H (inclusive) and O through Z (inclusive). Names must begin with a letter and can have up to eight characters.

h. All changes must be documented.

APPENDIX A

SAMPLE INPUTS AND OUTPUTS

A-1 General. This Appendix contains all the sample input files discussed above together with the resulting output reports. It will help the analyst to study the figures in this Appendix. This Appendix can also be used when putting the system on another computer.

INPUTS TO MODEL, RUN OF MODEL

```
INPUTS

100  BASE  YEAR  77
110  MODEL  MICO
120  SF
130  1.1  1.1  1.1  1.1  1.1
140  1.1  1.1  1.1  1.1  1.1
150  1.1  1.1  1.1  1.1  1.1
160  THRUPUTS
170  ROW  COL  AMT
180  2  1  1000.0
190  2  1  200
200  2  2  300
210  3  1  400
220  3  2  500
```

```
MODLA

NAME OF DATA INPUT FILE---?INPUTS

    5 THRUPUTS HAVE BEEN ADDED, AND THE TOT AMT IS:

RAW:        2400.00000

SHIFTED:    2640.00000

NAME OF FILE TO STORE RESULTS---?COSTFILE

RESULTS STORED IN COSTFILE
```

FIGURE A-1

OUTPUT OF MODEL, RUN OF REPORT GENERATOR

COSTFILE

101	1760.00	880.00	0.	0.
102	1320.00	330.00	0.	0.
103	440.00	550.00	0.	0.
104	0.	0.	0.	0.
105	0.	0.	0.	0.
106	0.	0.	0.	0.
107	0.	0.	0.	0.
108	0.	0.	0.	0.
109	0.	0.	0.	0.
110	0.	0.		0.
				0

```
RGENG

HOW MANY REPORTS, WHICH ONES---?8,1,2,3,4,5,6,7,8
COST DATA FILE---?COSTFILE
DEFINITIONS FILE---?KEYCOST
APPROPRIATIONS FILE---?FUNDING
TIME PHASING FILE---?SPREAD
INFLATION FILE---?INDICES
GIVE WORDS 1,2 AND 3---?SAMPLE WEAPON SYSTEM
ADJUST PAPER, GIVE RETURN
```

FIGURE A-2

KEYCOST AND SATELITES

KEYCOST

```
100  LABEL  LOCATION
110  HARDWARE  FILEAA
120  FLYAWAY  FILEBB
130  WEAP-SYS  FILECC
140  PROCMN'T  FILEDD
150  PROGRAM  FILEEE
```

FILEAA

```
100  QTY  1000
110  ROW  COL  FRACTION
120  3  1  1.0
130  3  2  .5
```

FILEBB

```
100  QTY  1000
110  ROW  COL  FRACTION
120  3  1  1.0
130  3  2  .5
140  2  1  .5
```

FILECC

```
100  QTY  1000
110  ROW  COL  FRACTION
120  3  1  1.0
130  3  2  .5
140  2  1  .5
150  2  2  .5
```

FILEDD

```
100  QTY  1000
110  ROW  COL  FRACTION
120  3  1  1.0
130  3  2  1.0
140  2  1  1
150  2  2  1
```

FILEEE

```
100  QTY  1000
110  ROW  COL  FRACTION
120  1  1  1.0
```

FIGURE A-3

FUNDING, SPREAD, INDICES AND SATELITES

FUNDING

```
100  ROW  CODE  FRACTION
110  1  1  .50
120  1  3  .50
```

INDICES

```
100  APPROP  LOCATION
110  1  RDFILE
120  3  PROCFILE
```

RDFILE

```
100  65  .70
110  66  .75
120  67  .80
130  68  .85
140  69  .90
150  70  .95
160  71  1.00
170  72  1.05
```

PROCFILE

```
100  65  .80
110  66  .83
120  67  .86
```

SPREAD

```
100  PHASE  1
110  CODE  1
120  YEAR  AMOUNT
130  65  100
140  66  0
150  67  110.
160  68  0.
170  69  120.
180  70  0
190  71  120
200  72  0
210  73  120
220  74  0
230  YEAR  PERCENT
240  75  .10
250  76  .20
260  7T  .05
270  77  .25
280  78  .20
290  79  .10
300  80  .05
310  81  .05
320  CODE  3
330  YEAR  AMOUNT
340  65  0
350  66  0
360  67  0
370  68  0
380  69  0
390  70  0
400  71  0
410  72  0
420  73  0
430  74  0
440  YEAR  PERCENT
450  75  0
460  76  0
470  7T  0
480  77  .1
490  78  .1
500  79  .1
510  80  .1
520  81  .1
530  82  .2
540  83  .1
550  84  .1
560  85  .05
570  86  .05
```

FIGURE A-4

HEADERS MAIN FILE AND SATELITES

```
AIRHD*

100  ROWST*  APPST*  COLST*
```

```
APPST*

101 RDT&E.................
102 PROC,AC...............
103 PROC,MSL..............
104 PROC,WPN..............
105 PROC,AMMO.............
106 PROC,OTHER............
107 OMA...................
108 MPA...................
109 MCA...................
110 FHMA..................
111 TOT,W/O ERDA..........
112 ERDA..................
113   TOTAL...............
114   PERCENT.............
```

```
COLST*

1              \SYSTEM                              GUID
2              \STRUC-      FRAME   PRO-      CONTR/  FIRE      ARMA-  PAYLOAD (TO BE   PEC    COMMON                         
3              \TURE                PULSION   COMMO   CONTROL   MENT   /AMMO   SPECI-   SPT    SUPPORT OTHER   TOTAL   PER-
4    COST ELEMENT \         (1)     (2)       (3)     (4)       (5)    (6)     FIED)    EQUIP  EQUIP                   CENT
5              65     66     67      68        69      70        71     72     (7)      (8)    (9)     (10)    (11)    (12)
6              79     80     81      82        83      84        85     86      73   74  75     76      77      77      78
                                                                                87   88  89     90      91      92      TOTAL
```

FIGURE A-5

ROW HEADERS FILE

```
ROWST*

101   RES & DEVELOPMENT
102     DEVELOPMENT ENGR
103     PEP
104     TOOLING
105     PROTOTYPE MANUF
106     DATA
107     SYS TEST & EVAL
108     SYS/PROJECT MGT
109     TRAINING
110     FACILITIES
111     OTHER
112   INVESTMENT
113     NON-RECURRING INV
114     PRODUCTION
115     ENGR CHANGES
116     SYS TEST & EVAL
117     DATA
118     SYS/PROJECT MGT
119     OPN'L/SITE ACT
120     TRAINING
121     INIT SP & REP PTS
122     TRANSPORTATION
123     OTHER
124   OPERATING AND SPT
125     MIL PERSONNEL
126       CREW P&A
127       MAINT P&A
128       INDIRECT P&A
129       PCS
130     CONSUMPTION
131       REPL SPARES
132       POL
133       UNT TNG AMMO/MSL
134     DEPOT MAINTENANCE
135       LABOR
136       MATERIEL
137       TRANSPORTATION
138     MODIFICATIONS
139     OTHER DIR SPT OPNS
140       MAINT, CIV LABOR
141       OTHER DIRECT
142     INDIRECT SPT OPNS
143       PERSONNEL REPL
144       TPP
145       QTRS, MAINT/UTIL
146       MEDICAL SUPPORT
147       OTHER INDIRECT
148   TOTAL, LESS ERDA
149   ERDA
150   TOTAL
```

FIGURE A-6

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT I—COST ELEMENT BY SYSTEM STRUCTURE

IN MILLIONS OF CONSTANT 77 DOLLARS

	\SYSTEM \STRUC- \TURE COST ELEMENT \	FRAME (1)	PRO- PULSION (2)	GUID CONTR/ COMMO (3)	FIRE CONTROL (4)	ARMA- MENT (5)	PAYLOAD /AMMO (6)	(TO BE SPECI- FIED) (7)	PEC SPT EQUIP (8)	COMMON SUPPORT EQUIP (9)	OTHER (10)	TOTAL (11)	PER- CENT (12)
1	RES & DEVELOPMENT	1760.0	880.0	0.	0.	0.	0.	0.	0.	0.	0.	2640.0	100.0
2	DEVELOPMENT ENGR	1320.0	330.0	0.	0.	0.	0.	0.	0.	0.	0.	1650.0	62.5
3	PEP	440.0	550.0	0.	0.	0.	0.	0.	0.	0.	0.	990.0	37.5
4	TOOLING	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	PROTOTYPE MANUF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	DATA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	SYS TEST & EVAL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	SYS/PROJECT MGT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	TRAINING	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	FACILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	OTHER	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	INVESTMENT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	NON-RECURRING INV	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	PRODUCTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	ENGR CHANGES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	SYS TEST & EVAL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	DATA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	SYS/PROJECT MGT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	OPN'L/SITE ACT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	TRAINING	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21	INIT SP & REP PTS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
22	TRANSPORTATION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23	OTHER	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	OPERATING AND SPT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25	MIL PERSONNEL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26	CREW P&A	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27	MAINT P&A	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
28	INDIRECT P&A	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29	PCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
30	CONSUMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	REPL SPARES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
32	POL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33	UNT TNG AMMO/MSL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	DEPOT MAINTENANCE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
35	LABOR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	MATERIEL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	TRANSPORTATION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
38	MODIFICATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
39	OTHER DIR SPT OPNS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
40	MAINT, CIV LABOR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
41	OTHER DIRECT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
42	INDIRECT SPT OPNS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
43	PERSONNEL REPL ,	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
44	TPP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
45	QTRS, MAINT/UTIL	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46	MEDICAL SUPPORT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
47	OTHER INDIRECT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
48	TOTAL, LESS ERDA	1760.0	880.0	0.	0.	0.	0.	0.	0.	0.	0.	2640.0	100.0
49	ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
50	TOTAL	1760.0	880.0	0.	0.	0.	0.	0.	0.	0.	0.	2640.0	100.0

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE KEYCOST FUNDING SPREAD INDICES

FIGURE A-7

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT 2---KEY COST DEFINITIONS

IN MILLIONS OF CONSTANT 77 DOLLARS

	TOTAL	QUANTITY	UNIT
HARDWARE	715.0	1000.0	0.7150
FLYAWAY	1375.0	1000.0	1.3750
WEAP-SYS	1540.0	1000.0	1.5400
PROCMN'T	2640.0	1000.0	2.6400
PROGRAM	1760.0	1000.0	1.7600

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE KEYCOST FUNDING SPREAD INDICES

FIGURE A-8

REPORT 3

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT 3---APPROPRIATION BY LIFE CYCLE PHASE

IN MILLIONS OF CONSTANT 77 DOLLARS

	R&D	INV	O&S	TOTAL	PERCENT
RDT&E....................	1320.0	0.	0.	1320.0	50.0
PROC,AC..................	0.	0.	0.	0.	0.
PROC,MSL.................	1320.0	0.	0.	1320.0	50.0
PROC,WPN.................	0.	0.	0.	0.	0.
PROC,AMMO................	0.	0.	0.	0.	0.
PROC,OTHER...............	0.	0.	0.	0.	0.
OMA......................	0.	0.	0.	0.	0.
MPA......................	0.	0.	0.	0.	0.
MCA......................	0.	0.	0.	0.	0.
FHMA.....................	0.	0.	0.	0.	0.
TOT,W/O ERDA.............	2640.0	0.	0.	2640.0	100.0
ERDA.....................	0.	0.	0.	0.	0.
TOTAL..................	2640.0	0.	0.	2640.0	100.0
PERCENT................	100.0	0.	0.	100.0	100.0

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE KEYCOST FUNDING SPREAD INDICES

FIGURE A-9

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT 4——APPROPRIATION BY YEAR (DETAIL)

IN MILLIONS OF CONSTANT 77 DOLLARS

	65	66	67	68	69	70	71	72	73	74	75	76	7T	77	78
RESEARCH AND DEVELOPMENT															
RDT&E.......	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	238.3	200.2
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	167.8	173.8
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
INVESTMENT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OPERATING AND SUPPORT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MICU INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT 4——APPROPRIATION BY YEAR (DETAIL)

IN MILLIONS OF CONSTANT 77 DOLLARS

	79	80	81	82	83	84	85	86	87	88	89	90	91	92	TOTAL
RESEARCH AND DEVELOPMENT															
RDT&E.......	105.1	55.2	57.9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1527.4
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	180.1	186.6	193.4	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	1952.0
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	285.2	241.9	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	285.2	241.9	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
INVESTMENT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OPERATING AND SUPPORT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MICU INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

Figure A-10

[redacted]

DATE: 01/23/76 TOTAL SYSTEM COST: 2640.0

REPORT 5---APPROPRIATION BY YEAR (TOTAL)

IN MILLIONS OF CONSTANT 77 DOLLARS

	65	66	67	68	69	70	71	72	73	74	75	76	7T	77	78
RDT&E.......	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	238.3	200.2
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	167.8	173.8
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0

	79	80	81	82	83	84	85	86	87	88	89	90	91	92	TOTAL
RDT&E.......	105.1	55.2	57.9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1527.4
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	180.1	186.6	193.4	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	1952.0
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

FIGURE A-11

REPORT 6

DATE: 01/23/76 TOTAL SYSTEM COST: 3479.4

REPORT 6—APPROPRIATION BY YEAR (DETAIL)

IN MILLIONS OF CURRENT DOLLARS

	65	66	67	68	69	70	71	72	73	74	75	76	7T	77	78
RESEARCH AND DEVELOPMENT															
RDT&E.......	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	238.3	200.2
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	167.8	173.8
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
INVESTMENT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OPERATING AND SUPPORT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

DATE: 01/23/76 TOTAL SYSTEM COST: 3479.4

REPORT 6—APPROPRIATION BY YEAR (DETAIL)

IN MILLIONS OF CURRENT DOLLARS

	79	80	81	82	83	84	85	86	87	88	89	90	91	92	TOTAL
RESEARCH AND DEVELOPMENT															
RDT&E.......	105.1	55.2	57.9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1527.4
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	180.1	186.6	193.4	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	1952.0
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
INVESTMENT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OPERATING AND SUPPORT															
RDT&E.......	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O&MA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

FIGURE A-12

DATE: 01/23/76 TOTAL SYSTEM COST: 3479.4

REPORT 7--- APPROPRIATION BY YEAR (TOTAL)

IN MILLIONS OF CURRENT DOLLARS

	65	66	67	68	69	70	71	72	73	74	75	76	7T	77	78
RDT&E.......	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	238.3	200.2
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	167.8	173.8
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	100.0	0.	110.0	0.	120.0	0.	120.0	0.	120.0	0.	82.3	172.9	45.4	406.1	374.0

	79	80	81	82	83	84	85	86	87	88	89	90	91	92	TOTAL
RDT&E.......	105.1	55.2	57.9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1527.4
PROC,AC.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,MSL....	180.1	186.6	193.4	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	1952.0
PROC,WPN....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,AMMO...	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PROC,OTHER..	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
OMA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MPA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MCA.........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FHMA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOT,W/O ERDA	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4
ERDA........	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL.....	285.2	241.8	251.3	400.7	207.6	215.1	111.4	115.5	0.	0.	0.	0.	0.	0.	3479.4

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

FIGURE A-13

REPORT 8

DATE: 01/23/76 TOTAL SYSTEM COST: 3479.4

REPORT 8---APPROPRIATION BY LIFE CYCLE PHASE

IN MILLIONS OF CURRENT DOLLARS

	R&D	INV	O&S	TOTAL	PERCENT
RDT&E....................	1527.4	0.	0.	1527.4	43.9
PROC,AC..................	0.	0.	0.	0.	0.
PROC,MSL.................	1952.0	0.	0.	1952.0	56.1
PROC,WPN.................	0.	0.	0.	0.	0.
PROC,AMMO................	0.	0.	0.	0.	0.
PROC,OTHER...............	0.	0.	0.	0.	0.
OMA......................	0.	0.	0.	0.	0.
MPA......................	0.	0.	0.	0.	0.
MCA......................	0.	0.	0.	0.	0.
FHMA.....................	0.	0.	0.	0.	0.
TOT,W/O ERDA.............	3479.4	0.	0.	3479.4	100.0
ERDA.....................	0.	0.	0.	0.	0.
TOTAL....................	3479.4	0.	0.	3479.4	100.0
PERCENT..................	100.0	0.	0.	100.0	100.0

MICO INPUTS SAMPLE WEAPON SYSTEM

COSTFILE FUNDING SPREAD INDICES

FIGURE A-14

APPENDIX B

COMPOSITE INDICES

B-1 General. This Appendix explains what composite indices are, how they are calculated, and how to use the composite index program. Composite indices are used widely, but the concept is rarely explained except in general terms. Therefore, this appendix contains more detail than some of the others. The user who already understands composite indices may skip to section B-7 which describes the computer program.

B-2 Definition and Use of Composite Indices. A composite index is the **ratio of a current (or "then year") obligated dollar to a constant (or** base year) obligated dollar. The word "composite" refers to the fact that the ratio combines the effects of price changes and of delays in expenditures.[1/] There are three points to remember about composite indices. First, each set of indices is constructed for use with time phased cost streams expressed in constant dollars of a specific base year. Second, they are used with obligations, not expenditures. Last, since they are ratios, one can convert time-phased constant dollars to time-phased current dollars, or vice versa, by multiplying or dividing, respectively. Table B-1 and Figure B-1 show the relationship between constant dollars and current dollars for RDT&E. In future years, more money will be required for the same level of effort. In past years,

[1/] If one time-phased using expenditures, as opposed to obligations, there would be no delay. In this case one would use price indices, not composite indices.

less money bought the same effort. In order to describe how composite indices are calculated it is first necessary to describe price indices and outlay rates.

CONSTANT AND CURRENT DOLLARS

YEAR	AMOUNT OBLIGATED EXPRESSED IN FY74 DOLLARS ($M)	AMOUNT OBLIGATED EXPRESSED IN CURRENT DOLLARS ($M)
70	1.0	.85976
71	1.0	.90759
72	1.0	.95356
73	1.0	.99632
74	1.0	1.04896
75	1.0	1.11324
76	1.0	1.17363
7T	1.0	1.23132
77	1.0	1.28797
78	1.0	1.34717

TABLE B-1

GRAPH OF CONSTANT AND CURRENT DOLLARS

(For a ten year project with a constant level of effort of 20 manyears per year)

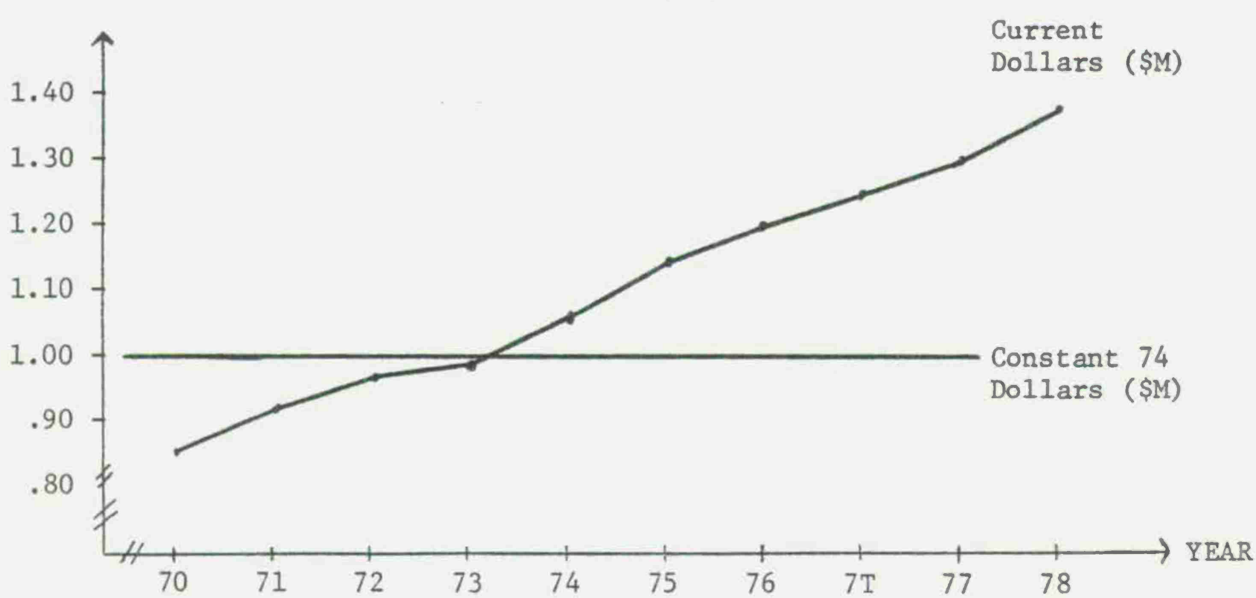


FIGURE B-1

B-3 Price Indices. A price index for a given year is the ratio of the level of prices in that year to the level of prices in a selected base year. By definition the base year must always have a price index of 1.000. Table B-2 shows a hypothetical set of price indices for RDT&E. Notice that price indices go forward in time and also backward. Often the inflation guidance for future years has one base year and the data for historical years has a different base year. The analyst then must normalize his data until all indices refer to the same base year.

B-4 Outlay Rates. Even though funds are obligated in a certain year, there is usually a delay before the funds are paid out. During this delay prices may change, so the decision maker, anticipating this, must ask for more. If there is only a short delay (such as for RDT&E) he needs only a little more. If there is a long delay (such as for MCA) he needs much more. Outlay rates are a set of numbers which express the way the funds are to be paid out. They can be thought of as the <u>fraction</u> of effort paid for in each year. Table B-3 shows a hypothetical set of outlay rates for RDT&E. As defined here, a set of outlay rates must add to 1.000.

PRICE INDICES FOR RDT&E

BASE YEAR: FY74

YEAR	INDEX
70	.8251
71	.8720
72	.9216
73	.9640
74	1.000
75	1.068
76	1.130
7T	1.190
77	1.245
78	1.302
79	1.362

TABLE B-2

OUTLAY RATES FOR RDT&E (1974)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Rate:	.45	.42	.09	.02	.02	.0	.0

TABLE B-3

B-5 Calculation of Composite Indices. The method for calculating composite indices, based on price indices and outlay rates is shown in Tables B-4 and B-5. For simplicity, these tables assume that one set of seven outlay rates will hold for all years. Actually, due to the introduction of "7T," different years require different sets of outlay rates. One can think of price levels in Tables B-4 and B-5 as expressing the cost of one FY 74 dollar's worth of goods. The number of dollars needed in each year is then the price level for that year times the fraction of effort (outlay rate) in that year. The total number of dollars is obtained by adding up the number of dollars needed in each year. Table B-4 shows that the combined effects of delays and price increases can be expressed by the number 1.0490. Table B-5 shows the same calculations for the composite index for a different year (FY 75). Indices for other years are calculated in the same way. Again, composite indices represent the ratio of obligated dollars (recognizing price changes and delays in expenditure) to obligated dollars (expressed in dollars of a selected base year). They are used to convert time phased constant base year obligations to time phased current (or "then year") obligations.

CALCULATION OF THE
COMPOSITE INDEX FOR FY74

(Using FY74 as the Base Year)

YEAR	PRICE LEVEL		OUTLAY RATES			COMPOSITE INDEX
70	.8251					
71	.8720					
72	.9216					
73	.9640					
74	1.000	*	.45	=	.4500	1.0490
75	1.068	*	.42	=	.4486	
76	1.130	*	.09	=	.1017	
7T	1.190	*	.02	=	.0238	
77	1.245	*	.02	=	.0249	
78	1.302	*			1.0490	
79	1.362					

TABLE B-4

CALCULATION OF THE
COMPOSITE INDEX FOR FY75

(Using FY74 as the Base Year)

YEAR	PRICE LEVEL		OUTLAY RATES			COMPOSITE INDEX
70	.8251					
71	.8720					
72	.9216					
73	.9640					
74	1.000					
75	1.068	*	.45	=	.4806	1.1132
76	1.130	*	.42	=	.4746	
7T	1.190	*	.09	=	.1071	
77	1.245	*	.02	=	.0249	
78	1.302	*	.02	=	.0260	
79	1.362				1.1132	

TABLE B-5

B-6 Changing the Base Year. By the way they are constructed, a set of composite indices can be used with time phased dollars of only one base year. But since price levels are ratios, it is easy to change the base year of the price indices, as shown in Table B-6. Select an alternate year, say FY 1975, and notice the price level for that year. If one divides every number in the column by this number, then all pairs of numbers will still be in the same ratios to each other. The result is a new set of price levels with the alternate year (FY75) as the new base year. Construction of composite indices for use with the new base year procedes exactly as before, as shown in Table B-6.

CHANGING THE BASE YEAR

(From FY74 to FY75)

YEAR	PRICE LEVELS (BASE 74)		PRICE LEVEL OF 75		PRICE LEVELS (BASE 75)		OUTLAY RATES			COMPOSITE INDEX
70	.8251	÷	1.068	=	.7726					
71	.8720	÷	1.068	=	.8165					
72	.9216	÷	1.068	=	.8629					
73	.9640	÷	1.068	=	.9026					
74	1.000	÷	1.068	=	.9363	*	.45	=	.4213	.9821
75	1.068	÷	1.068	=	1.000	*	.42	=	.4200	
76	1.130	÷	1.068	=	1.058	*	.09	=	.0952	
77	1.190	÷	1.068	=	1.114	*	.02	=	.0223	
78	1.245	÷	1.068	=	1.166	*	.02	=	.0233	
79	1.302	÷	1.068	=	1.219				.9821	
80	1.362	÷	1.068	=	1.275					

TABLE B-6

B-7 Composite Index Program. The Composite Index Program performs all the calculations described above. It reads an input file containing the price indices and outlay rates for one appropriation, changes the base year if required, does all the arithmetic, and writes the resulting composite indices to a file for later reference. To run the program, first create the input file in the format of Figure B-2, type RUN followed by the program name (the name of the latest program appears on a prompt card near the terminal) and answer the questions. The program will ask for the name of the input file described above, the name desired for the output file, and the year with which the composite indices are to be used. When the program is finished, the resulting composite indices have been written to a permanently stored file. Remember to purge the file when it is no longer needed. A preprinted form is at Figure B-3.

SAMPLE COMPOSITE INDEX INPUT FILE

```
100  OUTLAY  RATES
110  YEAR  RATES
120  75  .22  .58  .05  .09  .05  .01  0
130  76  .22  .07  .56  .09  .05  .01  0
140  7T  .02  .27  .56  .09  .05  .01  0
150  77  .22  .58  .12  .06  .02  .0   0
160  78  .22  .58  .12  .06  .02   0   0
170  PRICE  INDICES
180  YEAR  INDEX
190  75  1.155
200  76  1.2358
210  7T  1.2729
220  77  1.3493
230  78  1.4276
```

Notes:

1. Line 160. The last set of outlay rates is repeated as often as necessary to calculate the out years.

2. Line 230. The price change implied by the last two years is repeated as often as necessary to calculate the out years.

3. The four lines in this sample containing alphabetic data (lines 100, 110, 170, 180) must appear exactly as shown, except that different line numbers can be used.

FIGURE B-2

COMPOSITE INDEX INPUT FORM

```
100  OUTLAY  RATES
110  YEAR  RATES
120  ____ ____ ____ ____ ____ ____ ____
130  ____ ____ ____ ____ ____ ____ ____
140  ____ ____ ____ ____ ____ ____ ____
150  ____ ____ ____ ____ ____ ____ ____
160  ____ ____ ____ ____ ____ ____ ____
170  ____ ____ ____ ____ ____ ____ ____
180  PRICE  INDICES
190  YEAR  INDEX
200  ____ ____
210  ____ ____
220  ____ ____
```

Notes:

1. Lines 100, 110, 180, 190. Must appear exactly as shown, except that different line numbers can be used.

2. Line 170. The last set of outlay rates is repeated as often as necessary to calculate the out years.

3. Line 220. The price change implied by the last two years is repeated as often as necessary to calculate the out years.

FIGURE B-3

APPENDIX C

SENSITIVITY AND UNCERTAINTY

C-1 General. This Appendix has several purposes. First, it gives the analyst a brief description of sensitivity and uncertainty, and explains why sensitivity analysis is more often the preferred tool. Second, this Appendix provides a brief review of some of the main statistical principles behind uncertainty analysis. This review necessarily presumes a higher level of technical training than the rest of this guide, but it should provide most analysts the general understanding they need to answer questions about uncertainty analysis. Third, this Appendix tells how to do sensitivity and uncertainty analyses.

C-2 Sensitivity Analysis. Sensitivity analysis is a procedure in which the analyst changes the values of the key input variables (for example, the first unit costs or the number of units purchased) in order to determine how sensitive his point estimate is to changes in the values of these variables. Sensitivity analysis is also used to answer the many "what if" questions that managers ask (for example, "what if the Project Manager chooses an off-the-shelf engine, production of which involves no further learning?"). This technique is deterministic, in the sense that _if_ certain input values are true, _then_ a certain point estimate is completely determined. If other input values are true, then another, different, point estimate is determined. Each set of inputs produces one point estimate. Since sensitivity analysis reveals the effects of changing various assumptions, it gives the analyst a good understanding of his estimate. Sensitivity analysis is the only tool capable of answering these "what if" type questions.

C-3 How to Do a Sensitivity Analysis. To do a sensitivity analysis, the analyst changes the values of the variables in the data input file and makes repeated runs of the model. For example, suppose the first unit cost for production of airframes, denoted UC(1), is estimated to be one million dollars, with a standard deviation of .1 million dollars. The question is: what if our estimate of the first unit cost is wrong by as much as one standard deviation? If the base case data input file is named BASECASE, the analyst proceeds as follows:

a. Get a copy of the saved data input file by typing:

```
OLD
BASECASE
```

b. Check the existing data by listing the lines in question (unit costs start at line 700, see Figure 9):

```
EDIT LIST 700-705
```

c. The computer will respond by printing:

```
700  UC
705  1.0  0  0  0  0
```

d. Prepare another similar data input file for the high estimate by typing, for example:

```
RENAME  BASEHI
SAVE
```

e. Change the value of the variable being tested by typing:

```
705  1.1  0  0  0  0
REPLACE
```

f. Prepare another similar data input file for the low estimate by typing, for example:

```
RENAME  BASELO
SAVE
```

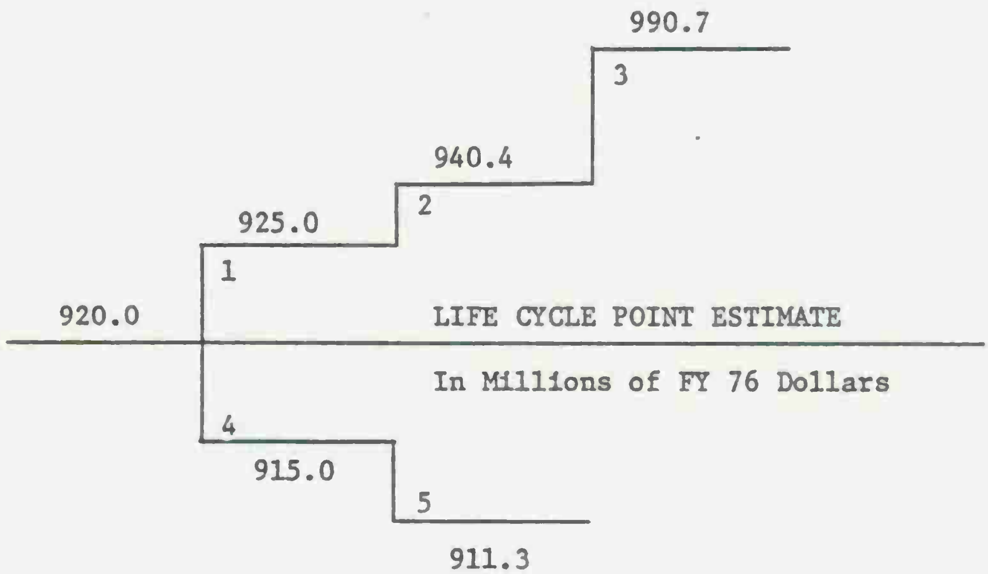
g. Change the value of the variable being tested by typing:

```
705  .9  0  0  0  0
REPLACE
```

h. The analyst can now do a sensitivity analysis by running the model three times, each time giving the name of a different input file. When the computer asks: Name of input file, he responds BASECASE the first time, and then BASEHI and BASELO the second and third times. There is no need to run the Report Generator to get the results. Instead, call up each of the files which store the results, using the OLD command, then type EDIT LIST 150. Recall that the last line stores the life cycle costs. Portray the results as in Figure C-1.

C-4 Uncertainty Analysis. Uncertainty analysis is a procedure in which the analyst specifies a statistical distribution for each cost cell making up the life cycle cost estimate (for some exercises he may choose a smaller subset, for example, he may address only certain cells in R&D). For each cost cell the analyst gives measures of central tendency (for example, the mean and the mode) and measures of dispersion (for example, the variance, the standard deviation and the coefficient of variation). If the distribution of the cost estimate

SENSITIVITY ANALYSIS



"HIGH" SENSITIVITY ASSUMPTIONS:

1. UC(1) increases by one standard deviation.
2. R&D schedule slips six months.
3. Increased reliability testing is required by single engine.

"LOW" SENSITIVITY ASSUMPTIONS:

4. UC(1) decreases by one standard deviation.
5. Increased reliability is realized in O&S phase.

FIGURE C-1

is not symmetric, the analyst also gives a measure of the skewness. Using one of several techniques, the statistical distribution of the total is then determined, as pictured in Figure C-2. While sensitivity analysis is a deterministic technique, and produces a point estimate, uncertainty analysis is a statistical technique and produces a distribution (usually in the form of a bell-shaped curve). Uncertainty analysis is used to give a general feeling for the spread of the final cost estimate.

C-5 Cautions When Doing Uncertainty Analysis. The analyst must be aware of the distinction between the mean, also called the "expected value", and the mode, also called the "most likely" (see Figure C-3). Referring to Report 1, if the numbers in the cost cells are means, then the totals are correct. But if the numbers in the cost cells are modes, then the totals are not correct (they are too low, generally). The only way to get the correct totals in this case is to use uncertainty analysis and rely on Monte Carlo or other techniques. Thus, there are two very different assumptions about what the cost cells estimate (mean or mode), and the totals generally are very different. Two points relate to the above discussion. First, if the mean and mode are different for a cost cell (for example, if it's distribution is skewed), then it is actually misleading to present the mode as a "best guess." Second, when it is evaluated, a CER gives an estimate of a mean, and this mean already includes the effects of the stretchouts, obstacles and other cost-increasing events found in the data base. If the analyst determines that his CER is predicting low, he should increase his point estimate in Report 1. This approach is better than trying to compensate for a low CER by leaving all reports low and then prescribing a skewed distribution for the uncertainty analysis.

UNCERTAINTY ANALYSIS

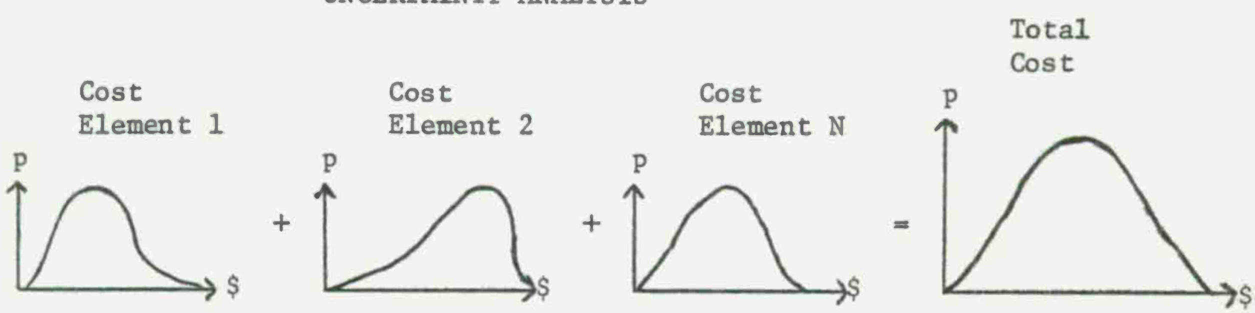


FIGURE C-2

MEAN AND MODE

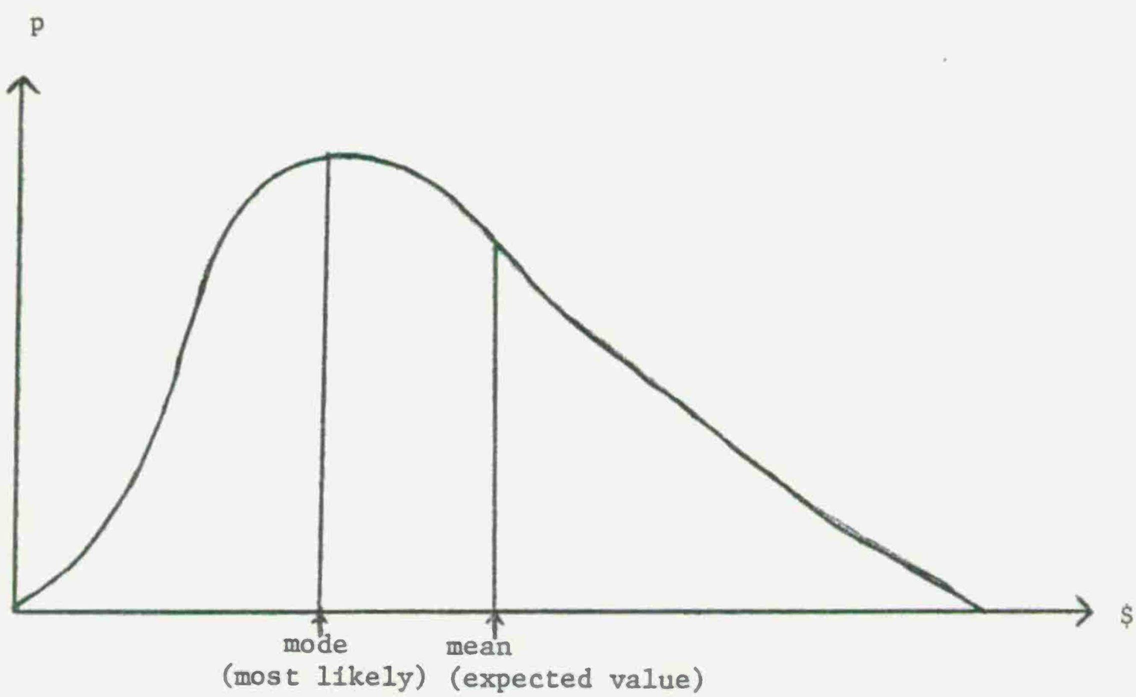


FIGURE C-3

C-6 How to Do an Uncertainty Analysis. The analyst can choose any aggregation, for example, he may choose R&D only, or R&D plus Investment. Also, it is possible to choose either the primary cost cells in which costs are calculated, or the secondary cost cells in which the subtotals are stored. It is important to avoid any double costing. After deciding what cells to include, the analyst must pick a low and a high amount for each cell. He then types RUN, followed by the program name (which changes periodically, see the prompt card near the terminal). The program leads the analyst through the analysis by asking questions. For each cell a low, most likely, and a high value is required. As the program is currently being revised, additional information is kept with the program, rather than in this guide.